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The

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ADDRESS TO THE ROYAL GEOGRAPHICAL SOCIETY.*

By Sir CLEMENTS R. MARKHAM, K.C.B., F.R.S., President.

Towards the end of our geographical year, a deep shadow was cast upon our work by the death of our revered and beloved patron, Her Majesty Queen Victoria. We endeavoured to mark our heartfelt sense of the loss we sustained, in common with all our fellow-subjects, by setting apart an evening meeting to commemorate the good and great qualities of her for whose loss we mourn.

At the same time we paid our tribute of congratulation, on the accession of his present Majesty, King Edward VII. The King was the oldest permanent official of our Society, having been Vice-Patron from 1862 to 1901. It is now my privilege to announce that His Majesty has been graciously pleased to accept the office of Patron of the Society, and to intimate his intention to continue the royal premium which had been granted to the Society by his two predecessors, King William IV. and Queen Victoria. Looking back at our Sovereign's connection with the Society for such a long term of years, we may feel assured that His Majesty will continue to take the same interest in our labours for the advancement of geographical knowledge in the future, as he has done, when Prince of Wales, in the past. No less interest has been taken in the proceedings at our evening meetings by His Royal Highness the Duke of Cornwall and York, who has been graciously pleased to succeed his august father as Vice-Patron of the Society.

The geographical work which is engaging most attention at the present moment is that connected with the International Conference at Christiania, for the exploration of the ocean. It is not the first time

* Read at the Anniversary Meeting, May 20, 1901.

that this Congress has met, but the present meeting is probably the largest and most representative that has yet been held. The main purpose of the Conference is to deliberate on the best means of exploring the North Atlantic, the North Sea, and the Baltic. The primary object of the study of these seas is avowedly economic: to devise means for ascertaining whether the supply of fish is declining, as is generally believed; what is the reason for such decline if it is really a fact, and the best means of preventing or checking its progress. Russia, Germany, and Norway have built vessels specially for this purpose, and have appointed their ablest men of science to carry out the necessary researches. It is very sad to see our own country taking part in the Conference in a half-hearted way. We must still hope that England will not be behind such small States as Norway and Denmark in contributing to an investigation that will yield rich results to science, as well as for the benefit of an important industry. Not only should our fisheries profit from the results of this great international enterprise, but it is probable that data may be collected that will enable us to forecast the weather for a much longer period than is at present possible. There is now little doubt that oceanic conditions have a marked effect on the weather.

Our former able and zealous librarian, Dr. Mill, has left us, to take charge of the British rainfall organization. It cannot, I think, fail to be gratifying to the Fellows of the Society to know that our late accomplished librarian has been selected by His Majesty's Government as one of the specialists to represent this country at the Christiania International Conference for the exploration of the ocean. Dr. Mill's services to geography in the past are well known, and I sincerely hope and trust that he may be long spared to render similar services in the future.

Dr. Mill has been succeeded, as librarian, by Mr. Heawood, whose experience as a field geographer, literary accomplishments, and intimate knowledge of our library make him a great acquisition to the Society.

During the past year considerable progress has been made by our School of Geography at Oxford. The attendance of students is highly satisfactory, and the institution of a Geographical Diploma by the University cannot fail to have a marked effect on the position of geography both at Oxford and at our public schools. There is reason to hope that, in the reorganized University of London, geography may in time be given a place of considerable importance in examinations. There is a Board of Geographical Studies in connection with the University, of which our secretary, Mr. Mackinder, and Mr. Chisholm are members. This Board is at present considering the place which geography should hold in matriculation, intermediate, and degree examinations, in certain of the faculties. If the place accorded to this subject is what we should all desire to see, there can be little doubt

that the recognition will lead to a marked improvement in geographical education throughout the country. In other directions there are gratifying signs, especially in the action of several School Boards, that geography is gradually winning its proper place in education.

Our Cambridge reader in geography, Mr. Yule Oldham, gave a course of lectures on the physical aspects of geography in the last Long Vacation, with the co-operation of Prof. Davis, of Harvard. The class numbered over two hundred, including many school teachers. During the academic year, Mr. Yule Oldham has given courses of lectures at Cambridge, which have been well attended by undergraduates.

With reference to the teaching of our science, I wish to draw special attention to the enterprise of Messrs. Andrews and Dickinson, whose slides, maps, and geographical pictures are a decided improvement on anything else that is available. Both of them are geographers and experienced teachers, and it is to be hoped that they will meet with sufficient encouragement to induce them to persevere in their enterprise.

On the retirement of Mr. Coles from the office of Map Curator and Instructor in April last year, there was unfortunately an interval of two months when instruction had to be suspended. Mr. Coles's place, as Instructor, was then taken by Mr. Reeves, who had succeeded as Curator. During the ten months that have since elapsed, Mr. Reeves has had forty pupils receiving instruction from him in surveying and astronomical observations. Out of this number three have obtained the Society's Diploma. Mr. James McCarthy, who has been the official surveyor in Siam for twenty years, is expected home in a few days, and it is anticipated that, in accordance with the arrangement made by the Council, he will then take up the work of instruction, which has attained such dimensions as to require the undivided attention of one official. I have every reason to believe that Mr. McCarthy will maintain this important branch of our operations at the high level that it has attained under Mr. Coles and Mr. Reeves.

Since I addressed you at the opening meeting of the Session last November, nothing of importance has occurred in the way of exploration. Major Gibbons has described to us the valuable work he accomplished in the Barotse country, and his journey thence to Cairo. His work has been embodied in a new map of Barotse, which will not only include Major Gibbons's observations, but all the trustworthy data collected by other travellers. Mr. Ravenstein has been engaged on this map for some time, the delay in its completion being accounted for by the vast amount of detail which has to be examined and embodied.

Several communications have been received from Sir Harry Johnston, the Special Commissioner in Uganda. I gather from them that Sir Harry, as is his wont, has been very active during the time he has

spent in that region. He has made journeys to most parts of the country under his charge, and will probably leave for England by the end of May. But before starting he will make the ascent of the great extinct volcano, Mount Elgon, a mountain region of special interest to the geographer. Sir Harry will bring home with him about a thousand photographs and maps, with valuable notes, which will form an important contribution to our knowledge of Uganda. I hope that he will give us a paper on his journeys at the opening meeting of next Session.

A very distinguished African traveller has just returned from another part of that continent. General Sir Frederick Lugard has had a trying time in Nigeria during the last eighteen months. He is strongly impressed with the value of good maps in conducting the work of developing such a region as is included in the European Protectorate of Central Africa. He has, therefore, devoted especial attention to the work of surveying, and I have reason to believe that he has returned with a mass of material from which an excellent new map of Nigeria may be constructed.

An admirable scheme has been prepared by the Intelligence Department of the War Office under Sir John Ardagh, which has issued an index map of Africa on the projection and plan of the map of the world on the one-millionth scale suggested at the International Geographical Congress of 1895. All those parts of Africa which have been actually surveyed are shown on the index map. They are, at present, insignificant in extent. The scheme of the Intelligence Department is to obtain from the various Governments and Geographical Societies which have an interest in Africa, the material available for filling in the map, and to issue the sheets as they are completed. It is a very laudable undertaking, but, in order that it may have a satisfactory result, accurate surveying operations will have to be undertaken. It is hoped that our Government, in conjunction with the Colonial Governments and the local administrations in the African Protectorates, will do all in their power to carry out the careful surveys necessary for the completion of the work.

We have to lament the loss of more than one distinguished geographer since our last anniversary. Our science has suffered a serious loss in the death of our Gold Medallist, Dr. George Dawson, the Director of the Geological Survey of Canada. His successor, Dr. Robert Bell, has had many years' experience in survey work, and I feel confident that he will maintain the high level which the Canadian Survey has attained. We also have to mourn the premature deaths of our gallant young associate, David Carnegie, of Dr. Schlichter, and of Mr. Frederick Pullar, a very promising young geographer, especially in connection with lake investigations. I fear that Sir John Murray will find it difficult to secure the services of one equally

competent and equally keen as a colleague to complete the work connected with British lakes which has been so well begun under his auspices.

I noticed the work of the Duke of the Abruzzi and of the Danish lieutenant Amdrup on the East Greenland coast in my opening address last November. Mr. Baldwin and Captain Bernier have not yet started on their attempts to reach the North Pole, and we must still wait some months before we can hope to hear news of Captain Sverdrup and Lieut. Peary.

We now have before us the geographical results of Mr. Borchgrevink's expedition to the Antarctic regions, and I consider that the expedition has done valuable pioneer work. Mr. Borchgrevink has published his book, and one of his staff, Mr. Bernacchi, has read us a very interesting paper at an afternoon meeting last March; while to Mr. Colbeck we are indebted for the maps and astronomical observations. The experiences of the *Southern Cross* in the pack add useful evidence to our previous information respecting the meridians on which that formidable obstacle should be entered. During the sojourn in Robertson Bay an instructive meteorological journal was kept, and the report on the geological and biological collections will no doubt show valuable results; but it is not yet published. I consider the most useful result of the voyage of the *Southern Cross* to be the important and interesting additions to our knowledge of the nature of the coast from Coulman Island to Cape Gauss, which have been made by the observant explorers. The fact that a landing was effected without difficulty on the great ice-barrier of Ross is also a notable result of the voyage. Mr. Borchgrevink here reached the furthest south ever yet attained. I feel bound, therefore, to bear my testimony to the value of the fresh information that we have derived from Mr. Borchgrevink's expedition.

The equipment and all the arrangements connected with our own Antarctic Expedition are approaching completion. I am anxious, in this address, to impress upon my colleagues the great responsibility that has been undertaken by the two associated Societies in despatching the expedition; to recognize the cordial assistance that we have received, especially from official sources; and to recapitulate our system, our objects, and the plan of operations through which we hope to secure success.

The Royal Society and the Royal Geographical Society are both actuated by one object, the advancement of science and the gathering in of important additions to the sum of human knowledge. The ancient and illustrious body which has entered upon this great national work in co-operation with us possesses a record which, as geographers, we revere. In the days of Sir Joseph Banks the science of geography was, for forty years, one of the chief cares of the Royal Society. We do not forget this. We do not forget the debt that geography owes to the great mother Society, and we feel it to be an honour to be associated with it in this important enterprise. In the course of our mutual labours, in

the consideration of so many intricate questions, I will not deny that there have been differences of opinion. This was inevitable with independent minds approaching problems from slightly different points of view. But the application of common sense will always dissolve such obstacles to a full agreement, and now I rejoice to be able to say that there is complete accord between the two Councils.

Our own Society has made great sacrifices for the promotion of a work which, I am sure, we all have at heart; and the subscriptions of our Fellows have been numerous and liberal, in one instance munificent. I desire, however, on this occasion, specially to commemorate the help we have received from the Government, and the sympathy our officers have met with in many directions. As soon as our expedition had received such an amount of support as proved that it would be a national undertaking, the First Lord of the Treasury took the question into favourable consideration. Mr. Balfour soon perceived not only that results of very great importance were to be expected from the expedition, but that its support was a matter of national and even of international consequence. This enlightened statesman obtained for us the grant from the Treasury; and we thus received a *status* which enabled the Admiralty to do something more than look upon our undertaking with favour.

As long ago as April, 1897, I had an interview with the First Lord of the Admiralty, who expressed sympathy, but could not then hold out any hope of material help. He, however, promised that, if an expedition was sent out, the Admiralty would supply the scientific instruments and appliances. But the position given to us by Mr. Balfour's effectual intercession changed the attitude of the Admiralty. In April, 1900, Mr. Goschen promised me two excellent officers, and since that time we have had to thank the Admiralty for much sympathetic help in many ways. Their lordships have lent us the services of no less than four naval officers, as well as petty officers and men, who are to receive pay and allowances during their absence. Stores at cost price have also been allowed to the expedition, in addition to the scientific instruments and appliances promised in 1897, which have been provided under the superintendence of the hydrographer, Sir William Wharton. Last, but assuredly not least, we are indebted to Sir William White for the invaluable services of Mr. W. E. Smith, one of the chief constructors, in designing the ship, and superintending the building throughout. The best thanks are certainly due to the Lords of the Admiralty from all who are interested in the expedition.

We also have to thank the chairman and directors of the P. and O. Steam Navigation Company for lending us the valuable services of Lieut. Armitage, R.N.R.; while the acts of kindness and sympathy from individuals have been numerous and most gratifying. Firms, such as Messrs. Colman and Messrs. Cadbury, have made liberal reductions and presents, and the publishers have been most kind in

making handsome presents to the library. In all these things we recognize that warm feeling for those who are about to brave dangers and hardships for their country's credit, which has always distinguished the English people. Nor must we be unmindful of the active sympathy shown by our foreign well-wishers. Through the intervention of my friend, Dr. Don Francisco Moreno, the Argentine Government has shown its desire to help in the work of antarctic research by liberally undertaking to establish a magnetic observatory on Staten Island. It will be in charge of a lieutenant of the Argentine navy, Don Horacio Ballvé, who is now in Europe ordering the instruments, and will dine with us to-night. For this useful co-operation our warmest thanks are due to their Excellencies, the Argentine Minister of Foreign Affairs, and Señor Dominguez, the Argentine Minister in this country, and to Dr. Moreno.

All who know anything of his work during the last nine months, must feel that in Commander Scott we have got the right man in the right place. To him alone is due the advanced state of the preparations. With a genius for organization, a clear head, an unfailing memory, he has seen to every detail himself, while he has made himself master of the problems that we look to him to solve. All this gives bright promise of what we may expect from this able and resourceful young officer in dealing with the sterner work that is before him. He is most ably supported. In Lieut. Armitage we have an accomplished navigator, of great arctic experience, and with a long training in sledge-travelling. Lieut. Royds, a nephew of Wyatt Rawson, who was the finest type of an arctic officer, Lieut. Michael Barne, Mr. Ernest Shackleton, Mr. Reginald Skelton, the engineer, Dr. Koettlitz, who also has arctic experience, and Dr. Wilson, an excellent artist, will form the staff of officers of the ship. There will also be a geologist, a biologist, Mr. Hodgson, and a physicist, Mr. W. Shackleton, to conduct investigations in their several departments. Mr. Hodgson has been for a cruise in the *Michael Sars* with Dr. Hjort, while Lieut. Royds has been to the summit of Ben Nevis, in mid-winter, to see the recording system for meteorological observations obtaining there, and to Lerwick after men. All are actively employed.

Mr. George Murray, of the British Museum, will direct the operations of the civilian staff during the passage out, and will get everything connected with their departments into thoroughly good working order. The magnetic observations, under the special supervision of the commander, will consist of a magnetic survey right round the world to the south of the 40th parallel, during the voyages out and home, across the oceans. This will be the principal magnetic work. Special interest attaches to the area in which the maximum magnetic intensity is expected to be found, south of Australia, and this area will be traversed. Observations will also be taken as far south as possible in the Ross sea. The commander will establish a magnetic base station

at one of the observatories, either Melbourne or Christ Church, New Zealand, and a secondary magnetic base at his winter quarters. Meteorological observations will be taken every two hours, and at Greenwich noon, throughout the period of the expedition. At the winter quarters, which will be south of the 74th parallel, they will have a special interest with reference to the anti-cyclone supposed to exist from about 74° south to the pole. These observations will all be under the direct supervision of the commander.

Deep-sea soundings will be taken, whenever it is possible, with serial temperatures, and samples of sea-water at various depths will be obtained for physical and chemical analysis. Tidal observations will be taken at the winter quarters. Dredging operations will be carried on whenever the circumstances are favourable, and it is the intention of the commander to dredge at considerable depths, so as to make the collection of antarctic flora and fauna as comprehensive as possible.

At my request, Mr. George Murray has undertaken to edit the 'Antarctic Manual,' which will be the work of various contributors, and will, as far as possible, embrace all that is known of the phenomena of the Antarctic Regions in the various branches of science. Our assistant draughtsman, Mr. Batchelor, has prepared the maps under my superintendence. The Manual will be most valuable to the officers, and will also be issued, as an extra volume, to our Fellows. The 'Antarctic Manual' will be dedicated, at Mr. George Murray's suggestion, to Sir Joseph Hooker, the venerable survivor of Sir James Ross's Antarctic Expedition.

The all-important measures, with reference to the conveyance of these trained officers and scientific civilians to their destined work, are connected with the provision of a suitable ship. This was, of course, the first question which engaged our attention. I ascertained the capabilities of existing vessels belonging to Scotland and Norway, and arrived at the conclusion that, effectually to meet and overcome the difficulties and dangers of the antarctic pack, it would be necessary to build an exploring ship specially designed for navigation in the southern ice. On April 5, 1899, in reply to my application, Sir William White was so good as to suggest to me that I might secure the services of Mr. W. E. Smith, one of the chief constructors, as architect of the exploring ship, and, most fortunately for the expedition, Mr. Smith was able to accept my proposal. I then called together a ship committee of arctic officers, who decided the general lines for the ship, and on April 17 Mr. Smith completed the plans. It was further decided, in May, on the representation of Captain Creak, that the magnetic observatory should have no steel or iron within 30 feet of it. This arrangement involved considerable expense and some sacrifice in other respects; but we feel assured that the value of the results will amply repay us.

The only firm in the kingdom that could undertake to build such

a ship was the Dundee Shipbuilding Company, and their tender was accepted in December, 1899. It was no easy task to collect the oak timber and other materials; nor could a sufficient number of wooden shipwrights be found anywhere else. I feel bound to bear my special testimony to the excellence of the work done by Messrs. Gourlay, the firm which built the engine. Our thanks are also due to our able architect, Mr. Smith; and to the chairman and secretary of the Ship Committee, Admiral Sir Leopold McClintock and Admiral Markham. Admiral Sir Anthony Hoskins should also receive the warmest thanks from all who are connected with or interested in the expedition, for his indefatigable and successful exertions on its behalf.

The naming of the ship was not an unimportant matter. Out of twenty names, I selected that name which best described her work, the work of discovery. In 1881 I edited the voyages of William Baffin, who discovered the bay which bears his name 285 years ago, and I remembered that his little vessel was named the *Discovery*. The first lunar observation ever taken by an English sailor was made on board her, as well as other scientific work which constituted her the prototype of exploring ships. Vancouver's ship had the same name, and so had one of Captain Cook's ships when Icy cape was sighted; so had Sir Harry Stephenson's ship, built in the same yard, which carried such men as Beaumont and Wyatt Rawson to the polar regions. It is a good name, worthily borne by ships of renown in the days of old; so on March 21, 1901, Lady Markham launched our Antarctic ship at Dundee, and named her the *Discovery*. She is one of the strongest ships ever constructed for ice-navigation, and the first ship ever built in this country specially for exploration and discovery. I am glad to be able to announce that the results of her trial trip last week were perfectly satisfactory. The *Discovery* will be handed over to Captain Scott in a few days, and will be brought round to the East India Docks by the end of the month. Our special thanks are due to Mr. C. Scott and the directors of the London and India Docks Committee for their liberality in resolving not to make any charge whatever to the *Discovery* for the use of their dock. Our Council has undertaken the duties and responsibilities of ownership, and your President will have to be "director" in accordance with the provisions of the Act of Parliament.

We have thus got the ship, and the scientific appliances, and right good men to navigate the ship and use the instruments. It remains to report to you the plan of operations.

My considerations respecting routes for an Antarctic Expedition will be printed at the end of this address. It will be seen that, for a small expedition with a single ship, the wisest course is to work from the known to the unknown, and this can only be done in the Victoria and Ross Quadrants, embracing the meridians from 90° E. across 180° to 90° W. Accordingly, I arranged with Dr. von Drygalski, the

Commander of the German Expedition, in October, 1899, that our sphere of work should be the Victoria and Ross Quadrants, while the Germans undertook the Enderby Quadrant.

Assuming that the exploring period will consist of two navigable seasons and one winter, the ice-pack should be sighted in December, 1901, and the ship should be forced through the ice on a meridian which the commander, after careful consideration of previous voyages, may decide upon as likely to be least encumbered with pack-ice. The whole navigable season, after reaching the south water, will be devoted to exploration in the ship. She will be taken down the east coast of Victoria Land, where open water may be expected, and eastward along the famous range of ice-cliffs discovered by Sir James Ross. An examination of this barrier, with a view to discovering the nature and origin of the ice-mass of which it forms the northern termination, is one of the principal objects of the expedition.

For sixty years this astonishing geographical phenomenon has been a subject of interest and speculation. It was supposed, by the late Mr. Croll and others, that the ice-cliffs were the termination of a vast ice-cap extending to the south pole. Mr. Bernacchi believes that the cliffs are one side of a glacial flow from the Parry mountains, a huge tongue of ice, and his chief reason for this opinion is that the slope is from west to east, not from south to north. His paper on the subject, which was read at an afternoon meeting last March, at which Sir Joseph Hooker and Mr. Blanford were present, was interesting and suggestive. My own impression, indicated in my paper of "considerations" which will accompany this address (p. 13), is that the ice-cliffs terminate a glacial mass between two mountain ranges, and thus fill an extensive sound or gulf. I think Mr. Blanford concurs in this view. The solution of this problem would be a brilliant result of the navigable season of 1901–2. Captain Scott will probably endeavour to advance eastward beyond the point reached by Sir James Ross, and it may be hoped that he will either discover the existence of land, or ascertain that land does not exist in that direction. The commander intends, if possible, to add a captive balloon to his equipment, a course which is strongly advocated by Sir Joseph Hooker.

But it is desirable that the expedition should return to the east coast of Victoria Land in time to establish the ship in safe winter quarters, if Captain Scott, in the exercise of the discretion that will be given to him, should consider that course advisable. It is a well-established canon, based on all former experience, that, in order to secure the best results for a polar expedition, the ship must winter. Sir James Ross fully intended to winter, and made a strenuous effort to find winter quarters. The leader of the German Expedition fully intends that his ship shall winter. Indeed, the observations which are among the results we seek, and the all-important exploration by land, could only be carried

out by the whole force of the expedition, which at best is not numerically too strong.

I therefore trust that Captain Scott may be able to find safe winter quarters for the ship. The evidence of the staff of the *Southern Cross* is that there are such winter quarters at Wood Bay in 74° 25′ S. There may be others further south, and possibly in McMurdo Bay. But it has been necessary to confine the area within which the ship may winter between Cape Johnson, the northern point of Wood Bay, and Cape Crozier, at the foot of Mount Terror. These limits are fixed so that, in the event of accident or detention, the ship may be easily found. Every arrangement has been made for wintering, and there will be three years' provisions on board.

The work of the dark months of winter will be occupied by observations of various kinds, taken by a staff efficiently trained and sufficiently numerous. Observatory huts will be erected on shore. In Wood Bay there is a level area of 150 acres suitable for this purpose. There will be a hut for magnetic observations, the instruments including a magnetograph. The meteorological observations will be regularly taken on shore as on board, and Captain Scott is considering the advisability of flying specially constructed kites with meteorographs. He will also be supplied with electric thermometry. Pendulum observations will be taken with an instrument supplied in this country; and Captain Scott will also install a seismological observatory with the instrument recommended by Prof. Milne. Tidal observations will be regularly taken. For all this work there will be a sufficient number of observers, but certainly not too many; and the dark winter months will be most usefully employed.

With the arrival of the sun the great land exploration work of the expedition will commence. Captain Scott has received complete details respecting every phase of sledge-travelling from Sir Leopold McClintock and Dr. Nansen, and has personally superintended the preparation of all the different articles of equipment. He has obtained a small supply of dogs from Siberia, and will perhaps take some of those belonging to Sir George Newnes from Stewart Island. In Lieut. Armitage the commander will have the valuable help of an officer who has had great previous experience during four seasons of dog-sledge travelling. The conditions of antarctic travelling are unknown. It is probable that dogs will be available in some directions, and that different methods may have to be adopted in others, much depending on the weather, and nearly everything else on the character of the country. But Captain Scott will doubtless adapt his methods to the exigencies of each case.

One sledging expedition, supported by depôts, will be directed due south; and we learn from the observant staff of the *Southern Cross* that the way round the eastern shoulder of Mount Melbourne, and along the ice-foot to McMurdo Bay, presents little difficulty. Another party will

probably be told off to examine the volcanic region of Mount Erebus. But the most important route will doubtless be to the westward, between Capes Gauss and Washington, where the land is low, where no distant mountains can be seen, and in which direction, by a system of carefully thought out depôts, a great distance may be reached, entailing important discoveries.

In this sledge-travelling I look hopefully forward to great results. No one yet has ever equalled or even approached the achievements of British naval officers in polar travelling. It is their own special work. I am taken back in thought to that memorable April day in 1851, when Captain Austin addressed the assembled sledge crews on the ice off the north-west point of Griffith Island. The distinctive flags of the officers were flying in the breeze and enlivening the white landscape, and then fourteen sledges started, with crews full of zeal and resolution, east, west, and south.

Over half a century will have passed away, and the eye of hope sees another gallant band, of another generation, assembled on an antarctic shore, with the leaders also flying their distinctive flags, and resolved that, in spite of hardships, in spite of dangers, good honest work shall be done beneath them. May our friends succeed in all their efforts. May they bring back a rich harvest of scientific results. The good wishes of their countrymen go with them. For apart from war there are great and good services for our gallant sailors to perform, and other paths to distinction.

> "Yes! there are paths in which success would shed
> Unfailing laurels on the victor's head;
> Do ye, by star-eyed science led, explore
> The icy ocean, the snow-encumbered shore."

To my mind this is the most important work of the expedition. Our explorers will, we earnestly trust, return safely, and without serious loss or injury, to the ship. But the difficulties will be great, the perils numerous.

Then will come the labour of cutting and blasting the ship out of the ice, and no better man could be in charge of such an operation than a torpedo officer. There is reason to hope that a ship may be cut out of the ice at an earlier period of the navigable season than that in which she can be expected to reach the land from outside.

It may be anticipated, therefore, that further exploratory work may be undertaken during the second navigable season of 1902–3. There are discoveries of great interest to be made westward of Cape Adare, either by pushing beyond Cape North or by examining the sea near the antarctic circle between the meridians of 160° and 110° E. The question whether there is continuous land, or only a group of islands in this direction, is a geographical problem of great interest which still awaits solution. The *Discovery* would return to her base station, at Lyttleton

(New Zealand), in April, 1903, to recruit men and officers, and fill up with coals and fresh provisions. She would then proceed with her magnetic survey across the Pacific, returning to this country in August.

This will be a very glorious achievement, even if one quarter of what is contemplated and suggested can be done; for the difficulties and dangers of the undertaking cannot be exaggerated. We who send our gallant countrymen forth on this hazardous enterprise are bound to see that all has been done that human foresight can devise to ensure their comfort and safety. It is necessary that there should be a second ship ready to proceed south in November, 1902, in the possible contingency of any accident, or of the detention of the *Discovery*. It is also very desirable that there should be sufficient funds for a third year. But the first of these objects is essential. There must be a tender to the *Discovery*—a second ship. The required funds must be raised. The feeling that this is necessary is becoming strong among those of our Fellows who have a sense of responsibility. I have just received a letter from a Fellow of this Society, who writes as follows: "On the assumption that the instructions for the conduct of the National Antarctic Expedition are definitely settled to the satisfaction of our Council, I shall be glad to contribute £5000 towards the provision of a second ship, the necessary tender to the *Discovery*." Another well-wisher has promised £500. We have thus had noble examples set before us. We are all bound to use our utmost endeavours to see that those examples are followed. It is our duty to see that all due precautions are taken for the safety of the gallant men who are going upon a perilous enterprise at our behest. *They* will do *their* duty, we know well. Let us do our duty by exerting ourselves in their interests. Then, when the time comes for the *Discovery* to start on her memorable voyage, with all on board resolved to do their utmost for the credit of Old England, we can, with a clear conscience, join in the hearty cheers of farewell. Then we can all raise the glorious cry, without anxiety, of "Southward Ho!"

CONSIDERATIONS RESPECTING ROUTES FOR AN ANTARCTIC EXPEDITION.

By Sir CLEMENTS R. MARKHAM, K.C.B., F.R.S., President R.G.S.

THE time has arrived for settling the plan of operations for the Antarctic Expedition; and I propose, after stating the objects laid down by the Councils of the two Societies, and offering some general observations, to pass in review the several routes which may be taken to reach the unknown region of the South.

The objects are stated in the report of our Antarctic Committee, which was adopted by the Council on February 12, 1894; and in the

Reports of the Antarctic Committees of 1887 and 1894, appointed by the Royal Society.

The main objects are to determine, as far as is possible, the extent and nature of the south polar land, to ascertain the nature of its glaciation and the condition of the ice-cap, to observe the character of the underlying rocks, and to make a magnetic survey south of 40° S. Much importance is also attached to meteorological observations, and especially to meteorological observations to the south of 74°. Deep-sea soundings with temperatures are also to be taken, and biological investigations are to be made.

The soundings and dredging work, outside the antarctic circle, can, however, be done at any time and in any vessel. It is not, therefore, a main object in a vessel specially built and strengthened for work within the antarctic circle; and for magnetic observations.

Without losing sight of the main objects of the expedition, it is desired by the Councils of the two Societies that as large results as possible shall be obtained for all the branches of science concerned. We cannot completely satisfy specialists as regards any one investigation, but all will be done that is possible to satisfy each, with due regard to the claims of others. There will be the work on or near the shore, and the work at sea. The first class of work includes (1) geographical discovery and exploration; (2) geology; (3) glaciation; (4) magnetic observations; (5) meteorological observations; (6) pendulum observations; (7) tidal observations; (8) inshore and land biology. Magnetic observations are especially important to ascertain the changes that have taken place since Ross's survey, and they should be carried to the most southerly latitudes attainable. The series of meteorological observations in winter quarters south of 74° S. possess more than ordinary importance with reference to the belief of leading meteorologists respecting an anti-cyclone. The work on board ship at sea includes (1) examination and survey of coast-lines; (2) magnetic observations; (3) meteorological observations; (4) deep-sea soundings; (5) marine biology. The subjects for investigation on shore are the most numerous and important. But we must arrange to give due attention to all. If the expedition continues its work for two years, and the ship winters, there would be ten months for the shore investigations, ten months for the work at sea, and four for the voyages out and home. With regard to the navigable period, Captain Larsen found the water on the east side of Graham island open in December. If the expedition lasts for three years, there will be a much longer time for the work at sea. The sea work will be continuous throughout the period of the expedition while at sea, whatever direction may be taken by the ship. It is, therefore, only necessary to consider the route with reference to the exploration of the unknown Antarctic lands. The exploration of the Antarctic Regions is also the object mentioned by the Treasury in announcing the Government grant.

Our expedition can in no sense be a reconnaissance. That work has been completely done. Indeed, all the antarctic voyages, except that of Ross, have been reconnoitring voyages along the edge of the pack. Our expedition must force its way through the pack. That is essential, and for this object the ship was designed and built. It must attempt a piece of definite work. The time at our disposal admits of no preliminary reconnaissance. It is also necessary that the ship should pass a winter in the far south, if the main objects of the expedition are to be attained. The German expedition will certainly winter. Sir James Ross saw that this should be done, and was anxious to find a position for winter quarters. In that respect, as well as in others, the advantage of a steamer over a slow sailing ship will be found to be very great. The idea of leaving a small landing-party on shore to pass the winter should be dismissed; as a weak party—and it must necessarily be weak—could not do a tenth part of the work that would be achieved by the whole force of the expedition.

The magnetic base of the expedition will be either at Melbourne or Christ Church (New Zealand), there being magnetic observatories at both places. The Germans will establish a magnetic observatory at Kerguelen island. The Argentine Republic, through the kind intervention of my friend Dr. Don Francisco Moreno, has undertaken to establish a magnetic observatory on Staten island.

In taking a general view of the Antarctic Regions, it is found that south of 40° S. there is very low atmospheric pressure all round the globe, with very large rainfall and snowfall, and strong westerly winds producing a current flowing to the east. But the winds south of 74° are from south and south-east, with surface currents in the same direction, so that the icebergs and the pack ice are continually drifted northwards during the summer. It is therefore assumed that there is a large anti-cyclone, with higher atmospheric pressure, far to the south; and that the south winds are attended by small precipitation. This, of course, means a considerable amelioration in the climate south of 74° or 75° S.; but no winter has yet been passed in so high a latitude. From this point of view, a winter south of 74° S. is, as I have already pointed out, an object of great importance.

It is very desirable to obtain some idea of the position and extent of the antarctic land, and it would seem that indications may be obtained from the position of the isotherm of 32° Fahr. air-temperature in summer. Where it is driven far to the north, the cause may perhaps be attributed to a great mass of frozen land on those meridians causing a high degree of cold; while in parts where it is far south a warmer region is indicated, caused by an extensive ocean with perhaps only a few islands. From 80° E. to the meridian of Greenwich this isotherm is as far north as 56°, and on these meridians is Enderby Land with its range of ice-cliffs, suggesting a very extensive land mass. But

from about 45° to 90° W. the isotherm is in lat. 63°, pointing to the landless Weddell Sea. So that the position of this isotherm possibly gives us some clue to the shape and extent of oceans and land masses far to the south of it.

The positions of extensive seas and land masses influence the position and movements of the polar ice-pack in its drift to the north. These would be more irregular in proportion to the extent of the sea over which they drift. In the Weddell Sea D'Urville found the pack in 64°, Ross in 65°, while Weddell himself had not reached it when he was in 74° 15'. Further east Ross found it in 71°, Bellinghausen in 69°, Biscoe in 66°. It varies also very much in character, in some places and times being loose and open, in others very close. There is very great difference in the position and character of the antarctic ice-pack in different seasons and in different localities; but the main difference, as regards navigation, is between a sailing vessel and a steamer, a difference which is almost immeasurable. There can be little doubt that a steamer might force her way through the pack on any meridian when there is open water to the south.

We know as yet very little of the antarctic lands, but we must use that incomplete knowledge as some guide for future work. The first question that arises is the source of the enormous icebergs which encumber the antarctic sea in such vast numbers. In the Arctic Regions, we know that the icebergs are derived from the discharging glaciers at the heads of narrow Greenland fjords. But the antarctic icebergs are on a much larger scale. Sometimes 1 and 2 miles in length, generally 150 to 200 feet high, they are flat-topped like the ice mass from which they are discharged. So far as we yet know, all antarctic lands have these ice masses ending in cliffs along their northern faces. Sir James Ross saw a range of bergs which had evidently broken off from the ice-cliffs stretching eastward from Mount Terror.

The range of ice-cliffs forming the termination of very extensive glaciers appears to be an invariable feature of the northern faces of antarctic lands. There is Enderby Land, which, from Captain Biscoe's description, is a long range of ice-cliff. There is Côte Clarie. There is the north side of Victoria Land, which Ross and McCormick describe as a long range of ice-cliffs stretching westward from Cape North. There is the long line of ice-cliffs extending eastward from Mount Terror, near the parallel of 78° S. for upwards of 400 miles.

These mighty glaciers, pouring their harvests of icebergs out into the seas which bound the northern coasts of antarctic lands, appear to be flanked on their eastern sides by ranges of lofty mountains running north and south — possibly on both sides, like Greenland. Biscoe reported them as black streaks seen through the mist to the east of Enderby Land. D'Urville saw them east of Côte Clarie. A lofty range of mountains flanks the eastern side of Victoria Land, and Ross was

almost sure that he could see high mountains beyond the eastern end of the great ice-barrier in 78° S.

A navigable sea may usually be expected on the eastern sides of antarctic lands, while the northern drift of ice may cause a similar lane of open water along the northern coasts in the summer. There may, therefore, be three reasons for open water in the antarctic seas: firstly, the currents drifting the ice away from the land; secondly, open lanes and pools caused by unequal rates of ice-movement in the pack, under the influence of winds and currents; and thirdly, the open water usually found north of the outer edges of the pack.

These general considerations apply to all parts of the Antarctic Regions. In examining the various routes by which the unknown area may be penetrated, it will be well to do so with reference to the four quadrants into which the Antarctic Regions have been divided for convenience of description: (1) the VICTORIA QUADRANT, from 90° E. to 180°; (2) the ROSS QUADRANT, from 180° to 90° W.; (3) the WEDDELL QUADRANT, from 90° W. to 0°; and (4) the ENDERBY QUADRANT, from 0° to 90° E.

I. VICTORIA QUADRANT.

First Route.

We turn first to the Victoria Quadrant, and find indications of land near the antarctic circle, from 122° E., where Balleny discovered Sabrina Island, a lofty mountain range covered with snow, on March 2, 1839, to the Balleny Islands in 165° E., also discovered by Balleny on February 12, 1839. The Balleny Islands are of volcanic formation, and have lofty peaks. Between these two points, Dumont d'Urville discovered Adelie Land in 140° E., lofty land nearly hidden by icebergs, on January 20, 1840. The French landed on one out of eight or ten rocky islets about a mile from the shore. Further west, in 128°, D'Urville sailed along a vertical wall of ice, 100 to 150 feet high, for twelve hours. He named it Côte Clarie.

Captain Wilkes, following in the wake of Balleny in 1840, reported distant mountains connecting the discoveries of Balleny and D'Urville and laid down a coast-line of vast extent representing land of continental proportions. But Sir James Ross found himself "nearly in the centre of the mountainous patch of land laid down in Lieut. Wilkes's chart." Sir George Nares saw nothing of Wilkes's supposed Termination Island when within 15 miles of it, and there were such discrepancies between the statements of Captain Wilkes and his officers that the matter remains in doubt. It is a question of great geographical interest; but we are only certain of Sabrina Island, Adelie Island with Côte Clarie, and the Balleny Islands. Ross believed that Wilkes's land was a chain of islands.

Sir James Ross had no doubt that the islands he sighted on March 3

and 4, 1841 (Russell Peak, Smyth Island, and Frances Island), were the same as the Balleny Islands. But Mr. Colbeck tells me there are two separate groups, not far from each other. Balleny gave the following names to the five islands he discovered; *Sturge*, *Buckle*, *Borradaile*, *Young*, and *Row*.

The isotherm of 32° Fahr. is as far south as 62° S., from 140° to 80° W.—a possible indication that Sabrina and Adelie are only large islands, and that any continental land is far to the south. In fact, there is a space of 250 to 300 miles in width between these indications of land near the antarctic circle and Victoria Land.

The north coast of Victoria Land commences with Cape Adare, the eastern point, a lofty headland of volcanic rock, in 71° 30′ S. Thence the land trends north-west 120 miles to Cape North. In February, 1841, a solid pack extended for 8 or 9 miles from the shore near Cape Adare, rendering a landing impossible, while in 1895, 1899, and 1900, a ship was able to approach close to the shore. This is one example of the changes that take place in the position of the pack.

The next cape westward of Cape Adare is Cape Wood, and between there is a deep bay, which Sir James Ross named Robertson Bay. Here lofty inaccessible mountains rise almost from the beach. The northern extreme of land seen by Ross was named Cape North. The land then trends far to the south of west, but off Cape North Ross was stopped by a dense body of ice, on February 22, 1841. He was anxious to find winter quarters, but all the indentations of the coast were filled with ice of great thickness. Beyond, the line of coast consisted of a long range of ice-cliffs 200 and more feet high, with a chain of grounded bergs some miles in front of them; soundings in 180 fathoms. The ice-cliffs probably form a coast-line of considerable extent, and a dense pack of ice occupied the space to the north and west.

The Newnes Expedition wintered on shore, in Robertson Bay, from February, 1899, to February, 1900, and a valuable series of magnetic and meteorological observations was taken by Mr. Colbeck and Mr. Bernacchi. The position, so close under lofty mountains, and where the coast turns abruptly from east and west to north and south, probably has a climate which is quite abnormal. No attempt was made to explore along the coast to the westward.

The first route, in the Victoria Quadrant, would pass through the pack to Cape Adare, and then westward over the sea which is bounded on the south by the north coast of Victoria Land. The pack met with by Ross might be rounded, early in the season, at its northern edge, it might have moved, or it might be penetrated. The results of success in this direction would be of great interest both to geographers and magneticians. The extent of Victoria Land to the westward might be ascertained, and the questions connected with the indications of land on the antarctic circle between the meridians of 120° and 160° would

receive solution. On the other hand, there appear to be great accumulations of pack-ice in this direction.

Second Route.

The second route in the Victoria Quadrant is that indicated by the famous voyage of Ross, who was obliged to leave the work undone owing to the want of a steamer. In slow sailing-vessels it was not possible for him to seek out and make his way into secure winter quarters, so that he only pointed out the quantity of valuable work that might be done. Borchgrevink followed in Ross's wake. Only six landings have been effected, each for a few hours or less. These landings have been on Possession Island in 72°, Coulman Island in 73° 20', Wood Bay in 74° 22', Franklin Island in 76° 10', near Cape Crozier in 77° 25', and on the ice-barrier in 162° 30' W.—two by Ross and four by Borchgrevink. The work here remains to be done, and it is work of extraordinary interest. For nearly 300 miles there is a line of coast facing to the eastward, and therefore with a navigable sea along its shore. It is flanked by a range of lofty mountains running north and south, while in the far south is the active volcanic region of Mount Erebus. Then stretching away for hundreds of miles to the eastward is that famous ice-barrier, the scientific investigation of which is one of the chief desiderata of geographers.

In approaching this route, Sir James Ross entered the pack in 66° 55' S. and 174° 34' E. on the 5th, and reached open water on the 9th of January, 1841. There is reason to suppose that at least equal success might be obtained by a steamer early in December, which would at once proceed to the most eastern point reached by Ross along the barrier. The steam power may outweigh the greater closeness of the pack early in the season. At the most eastern points of Ross and Borchgrevink the pack was pressing against the barrier late in February of 1842 and 1900, but this may not be the case in another year, and the pack may not be impenetrable in December, when the frosts will not have cemented it together with young ice. In that case most important discoveries will be made to the eastward, especially if the land beyond the barrier turns to the south with an eastward face, and thus offers a navigable channel along its shore.

Later in the season there might be a thorough investigation of the ice-barrier and the interior ice-cap. Ross had concluded that the ice-cliffs could not be resting on the ground, after soundings at a depth of 420 fathoms and again at 250 fathoms. All this should receive investigation, and the character of the ice-cap should be studied. When a landing was effected in 1900, a distance of about 15 miles was reached by dogs drawing a sledge, and men on ski, along a gentle ascent of hard smooth snow. In the distance what appeared to be a hill proved to be hummocks of blue ice.

Unable to approach very near to inlets or bays for fear of being beset, Sir James Ross supposed them all to be filled with ancient ice, and to offer no winter quarters. But the *Southern Cross* was able to take refuge from the gales of wind far up Robertson Bay, and Wood Bay is also said to offer good winter quarters. Even if the ice in some of the bays never moves, that very fact will supply the necessary protection to a ship from drifting pack, especially if some kind of dock is cut.

McMurdo Bay is a desirable place for winter quarters, in full view of the great burning volcano. Here there is probably a better climate than at Cape Adare, because it is within the anti-cyclonic region. Thence journeys of the utmost importance could be undertaken, which would secure some of the main objects of the expedition. The volcanic region itself could be explored. A journey due south would enable researches to be made along the edge of the ice-cap, while a journey westward into the interior would be of equal importance, and would possibly effect co-operation with the Germans working in from the west. Wood Bay, however, is the best winter harbour, so far as we yet know.

This, then, is the route which offers the best prospect of securing the main objects of the expedition with the best chances of complete success and the minimum of risk.

II. The Ross Quadrant.

Third Route.

We will next consider the Ross Quadrant, extending from 180° to 90° W. south of the Pacific ocean. In 1842, Sir James Ross entered the pack near the antarctic circle in 156° 28 W., and, after long detention from the ice and encountering some danger, he reached the ice-barrier in 161° 27' W. on February 23. From this point, looking to the east, mountains of great height were made out, occupying 30° of the horizon, with an undulating outline. There appeared to be much drifting pack to the eastward.

Captain Cook reached the edge of the pack in 71° 10' S., in long. 106° 34' W., on January 30, 1774. The pack consisted of loose or broken ice closely pressed together, and within it ninety-seven bergs were counted, like a ridge of mountains rising one above the other until lost in the clouds. Sir James Ross, Dumont d'Urville, and others have been of opinion that what Cook saw was land. But Captain Cook himself was much the best judge on that point. Possibly the bergs may have been grounded, and if so land would not be very far distant. But the way the ice was seen to drift from the *Belgica*, without check, when near Cook's farthest, seems to show that there is no land near that latitude.

A powerful steamer might penetrate through the pack between

Cook's farthest and the track of Ross. She would then reach land by steaming across the navigable water beyond, and effect a considerable extent of valuable exploration. Such an examination of the Ross quadrant would include work of the greatest interest and importance to science, but not without considerable risk.

III. Weddell Quadrant.

Fourth Route.

The Weddell Quadrant, extending from 90° W. to the meridian of Greenwich, is divided into three sections—the first, from 90° to 60° W., is occupied by the Dirk Gherritz archipelago; the second, from 60° to 30° W., embraces the Weddell sea; and the third, from 30° to 0°, includes the rest of the pack edge examined by Sir James Ross.

In 1599 one of a fleet of five Rotterdam ships was said to have been separated from the rest. She was named the *Blyde Boodschap*, commanded by Dirk Gherritz. It is stated in a French collection of voyages to the Straits of Magellan, published twenty-three years afterwards, that Gherritz was carried by tempestuous weather to 64° S., where he saw a land with snow-covered mountains. Gherritz is not recorded to have said so; his journal does not exist, so far as I am aware, and no longitude is given. If he did not sight the land until he was in 64° S., he certainly did not discover the South Shetlands, which would have been far to the north; nor is it credible that a vessel trying to enter Magellan's Strait could have been driven so far south. In Van Noort's *Description du penible Voyage*, Gherritz is said to have been taken prisoner by the Spaniards at Valparaiso. Van Noort heard of him as a prisoner at Lima. He never appears to have returned to give an account of his voyage. The Cape Horn route was then unknown. Nevertheless the Dirk Gherritz archipelago is a convenient name for the South Shetlands and the numerous islands to the south, including Graham Island.

The only parts of the Dirk Gherritz archipelago which enter the antarctic regions are Graham Island and Alexander Island. The former was discovered by Captain Biscoe on February 14, 1832. He then saw a very high peak, which he named Adelaide Island, with a thin scattering of snow from the summit to a third of the way down, and the lower part buried in snow and ice. With reference to this bareness of the higher parts of some antarctic mountains, Arçtowski observes that in making an ascent he passed through a belt of mist for the first few hundred feet, and above that there was an absolutely clear sky and dazzling sunshine, so that it is easy to see how the higher rocks become free of snow in summer, while those near sea-level remain covered.

In the following days Biscoe discovered several small islands further

north, and a long range of high mountains behind them. These form the backbone of Graham Island, which is long and narrow, extending on both sides of the antarctic circle. Further to the south, the Russian commander Bellinghausen had discovered Alexander Island in 69° 30' S. more than twenty years previously, in 1821. In February, 1898, the *Belgica* ran close along this western coast of Graham Island, noting the many rocks and islets extending to a considerable distance from the shore; but Alexander Island was inaccessible owing to the ice-pack. Arçtowski describes the view obtained from a point at the edge of the pack. Graham Island seemed to terminate, the land turning towards the east. Alexander Island appeared to be a mountain mass, from which lofty and majestic peaks rose, with lower land to the south. The glaciers seemed to fail to reach the sea, but to coalesce together in one great ice-foot which discharges numerous tabular icebergs.

The *Belgica* wintered in the pack to the west of Graham Island, and drifted nearly as far as Cook's farthest, from the 75th to the 103rd meridian in lat. 70° to 71° 30' S. Over this area there proved to be a continental shelf 270 fathoms below the surface, and to the north an abrupt descent to 800 fathoms.

On this route there is little chance of penetrating the extensive pack in which the *Belgica* wintered, or of making any successful exploration on the western shores of Graham or Alexander Islands, which are likely to be encumbered with pack-ice within the antarctic circle. The continental land indicated by the shelf discovered by the *Belgica* is probably at a great distance to the south, for the isothermal line of 32° air-temperature in summer here comes down as far as 62° S.

Fifth Route.

The eastern shore of Graham Island offers a more easily navigable sea, caused by the ice drifting away from it, as would be the case with all antarctic lands having eastern aspects. It is so far north that it is not necessary to force a way through the main ice-pack before reaching the navigable lane under the lee of the land. In December, 1893, Captain Larsen, of the Norwegian ship *Jason*, got into this lane early in the season, and crossed the antarctic circle as early as the 3rd, reaching his furthest south in 68° 10' S. on the 6th. The pack was drifted to some miles from the coast, which consisted of a lofty ice-foot with high mountains above. But several deep fjords penetrated into the land through the ice-foot, where seals and king-penguins were abundant. Captain Larsen was stopped by pack-ice, and there would be little object in penetrating further, because when the south end of Graham Island was reached, the main pack would be encountered. In this part of the Antarctic Regions there is probably an ocean of vast extent.

Sixth Route.

The so-called Weddell Sea, which Weddell himself named King George IV. Sea, was a temporary opening in the pack during February, 1823, in this quadrant, to the east of Dirk Gherritz archipelago. Captain Weddell, in the brig *Jane*, of 160 tons, left the South Orkneys on his voyage to the south in the middle of January. He encountered many large icebergs between February 7 and 15, but on the 18th, in 72° 38′ S., not a particle of ice was to be seen. On the 20th he was in 74° 15′ S., with only three bergs in sight, but many whales and innumerable birds. There was a fresh southerly breeze, so he returned. The longitude was 30° E.

This was a very remarkable voyage, for, though so far south, Weddell had not yet reached the edge of the pack. It was probably not far off, and would drift up during the last days of February and beginning of March with a south wind. There was no appearance of land, the numerous birds being signs of any open water, and not necessarily of water near land. Weddell's open water was the open water found near the edge of the pack, and had not the same cause for its existence as the navigable sea on the eastern side of Victoria Land, or as the lane of water to the east of Graham Island. There was just as little reason to suppose there was land to the westward of Weddell's position in 74° 15′, nearer than Graham Island, as there was to suppose its existence in any other part of his course south, where it is known not to exist. A little to the eastward Ross found the deepest part of the ocean —4000 fathoms.

The voyage of Weddell is exceptional. When Dumont d'Urville crossed his track, the ice-pack stopped him in 64° S. Ross, in 1843, found a continuous line of pack from Louis Philippe Island eastward, with heavy floes very closely pressed together. It was drifting fast to the north in January. Ross examined hundreds of miles of the pack edge without finding a single opening. He crossed Weddell's track in 65° 13′ S., finding a dense impenetrable pack. Sir Joseph Hooker was inclined to think that this pack was not the result of a summer northward drift of the winter ice; it was too dense for that, and there was never a trace of water-sky over it. His opinion is that, where there are vast areas of landless ocean, the pack moves over it, blocking up wide spaces for indefinite periods. But whether the main pack is found in 64° S. or to the south of 74° S., it is certainly of immense extent in this part of the Antarctic Regions, and a vessel must force her way through it before any of the important exploratory results can be attained. This would take an indefinite time, with the danger of long detention. So that the Weddell route offers the minimum of results with the maximum of risk.

IV. Enderby Quadrant.

Seventh Route.

The Enderby Quadrant extends from the meridian of Greenwich to 90° E., and the circle is thus completed. Here the isotherm of 32° Fahr. air-temperature, in summer, reaches to 54° S., indicating an extensive mass of frozen land in the centre of the quadrant. The northern face of this land was discovered by Captain Biscoe in 1831. The land seen a year or two afterwards by Captain Kemp, a little to the eastward, was no doubt a continuation of the same land. In 1831 Captain Biscoe followed the edge of the pack, near the antarctic circle, encountering very severe weather during the month of February. The wind was strong, with snow-squalls, and he found himself in heavy seas amongst innumerable icebergs. On the 25th, when in 58° E., Biscoe sighted land at a considerable distance, but there was a closely packed mass of ice intervening. He made out lofty cliffs with a perfectly smooth surface; and says that "the cliffs bore the marks of icebergs having been broken from off them, as the bergs were exactly similar to the cliffs in every respect." The range of ice-cliffs was traced for many miles from the foretop, with a good telescope. This was on February 25. On the 27th land was again clearly distinguished, and the black peaks of mountains showed through the snow. It was named Enderby Land.

Here we have a long line of ice-cliffs forming the northern face of an extensive land, and flanked to the eastward by high mountains, as in Victoria Land.

The eastern third of the Enderby Quadrant, to the east of the land discovered by Biscoe, was visited by the *Challenger* in 1873. She met with dense pack in 65° 42' S. and 79° 49' E. on February 19. The antarctic circle was crossed in 78° 22' E., and the ship followed the western edge of the pack for 150 miles, proceeding eastward to within 15 miles of Wilkes's supposed "Termination Island." The soundings in the sea traversed by the *Challenger* gave a depth of from 1250 to 1975 fathoms. Westward of 80° E. very few icebergs were met with, but eastward of 92° E. they were very numerous. Their absence between 70° and 80° E., except close to the pack edge, was so marked that, coupled with their absence on the same meridians in lower latitudes, the conclusion was arrived at that there could be no land for a considerable distance to the south between 70° and 80° E., and that a high latitude could be reached in that direction between Enderby Land and Victoria Land.

Here, then, there appears to be an admirable route for successful exploration, with an open pack, a sea little encumbered by icebergs, and probably navigable water along the eastern coast of Enderby Land. It is the route selected for the German expedition, I believe under the

advice of Dr. Neumayer. The intention is, if possible, to winter on the west coast of Victoria Land, and to send travelling-parties to penetrate as far as Gauss's magnetic position. From these winter quarters there may be valuable co-operation with the English expedition wintering in Wood Bay or McMurdo Bay, both with regard to the magnetic observations and in other respects. No better route could be selected, and we must wish our German colleagues all possible success—a success which their careful organization, their close attention to details, and their wise and well-considered arrangements so well deserve.

For the English expedition the route must be selected which offers the best opportunities for securing the desired results within the time; it should be the route which leaves least to chance or to unknown conditions, and the one by which the least amount of risk is run. It is also desirable that it should be the one which is most favourably situated for co-operation with our German colleagues, and most conveniently placed with reference to the magnetic base, and to a head-quarters whence succour could be sent.

That route will lead to success. It is a matter of grave moment that no mistake should be made.

A SURVEY IN BAFFINLAND, WITH A SHORT DESCRIPTION OF THE COUNTRY.*

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The following paper will give an account of a survey of part of the southern coast of Baffinland, and of an exploration into the interior of that great island in 1897, both of which are shown on the accompanying map. The sending out of the steamship *Diana* by the Government of Canada in that year, to make further investigations as to the navigation of Hudson strait, afforded the Geological Survey of the Dominion an opportunity for two parties to go at the same time to examine the rocks and make topographical surveys on both sides of the strait.

The writer was placed in charge of the work on the north or Baffinland side, and Mr. A. P. Low of that on the opposite shore. We were provided with small yachts, 35 feet long, well built, and good sailers, but incapable of resisting ice-pressure. They had each a comfortable little cabin, a coal-oil stove for cooking, and accommodation forward for four seamen. The yachts, and a boat for each, were carried to the strait, at some inconvenience, on the deck of the *Diana*, and launched on the

* Map, p. 120. All names which had been given to localities in the area covered by this map are retained. The additional ones have been given by Dr. Bell as necessary for the purpose of description.

arrival of the ship at our respective destinations. Each took 3½ tons of pig-iron as ballast, and we found room to stow away enough of provisions, petroleum, camping outfit, clothing, ammunition, etc., to last for a year in case of necessity.

The *Diana*, a Newfoundland sealing steamer, with a total company of forty-three persons, left Halifax, Nova Scotia, on June 3, and, going by way of the west coast of Newfoundland, passed through the straits of Belle Isle three days later without delay, but when off Hamilton inlet, we became surrounded by a wide field of ice, and lost about ten days before we got free again. On June 22 we reached the entrance of Hudson strait, and found the sea thereabouts all clear of ice. In steaming up the strait, however, we kept too close to the north shore, and got caught in drifting ice at Big island, which stands boldly out from the mainland, and is exposed to the full force of the ice-floe along the shore. After having been unpleasantly jammed for some time at this place, we got away and steamed, without difficulty, into Hudson bay, which we reached on July 12.

The programme laid down for the *Diana* by the Department of Marine and Fisheries required her to make a voyage completely through the strait as soon as she should arrive there, then to land the Geological Survey parties; after which she was to make occasional voyages between Hudson bay and the Atlantic. In the course of one of these trips she was to pick up the geologists and their men and convey them to St. John's, Newfoundland, and then return again and navigate the strait till as late a date as possible.

My yacht and stores were put off the ship at Ashe inlet, Big island, on July 20, and it was arranged that she should call for me again at the same place on September 10. In the mean time, I proposed to examine and map as much as possible of the coast, and, if time permitted, I intended to do some exploring in the interior. I had already made several voyages through Hudson strait, one by the Hudson's Bay Company's barque *Ocean Nymph* in 1880, and the others by the expeditionary steamers *Neptune* and *Alert* in 1884 and 1885, so that I was already tolerably familiar with the landmarks and the character of the strait. If a chart had existed by which it might have been possible to recognize with certainty any point about the entrance to Fox basin, I could have met the ship there, and so have saved a long return journey in my yacht, but the above inlet was the only locality sufficiently well fixed to make a sure rendezvous.

My main object was to investigate and bring away a record of the geology of the coast, and this required a topographical survey of some sort to give it a permanent value. On account of the great distance to be traversed, the intricacies of the coast, the swiftness of the tidal currents, the dangers and interruptions from running ice and other difficulties which we encountered, I soon found that it would be impossible

to undertake an exact instrumental survey of the coast in the time at my disposal. I therefore determined to make what we call a track-survey, which means the mapping of the geographical features by the best method available. In this case the track-survey consisted of a rough triangulation by approximate bases measured by our progress in a given time, with many intersections of courses, and by constantly taking bearings and estimating distances to all points in sight. These formed the basis of diagrams, drawn to a scale, of section after section of the coast and islands as we went along. The more detailed contours of the shorelines, the positions of islands, etc., were often sketched with the aid of compass-bearings from the tops of hills overlooking the sea. A large number of positions were fixed by means of many observations for latitude, and of numerous others for longitude. On putting the results together, it was found that the diagrams required to be only slightly adjusted in most cases, in order to correspond with the positions thus established, so that the accompanying map, reduced from a compilation on a large scale, is a fairly accurate representation of about 200 miles of the southern coast of Baffinland, both as to distance and correctness of position throughout. Charles island and a portion of the south shore of the strait, shown on the accompanying map, were sketched partly from the *Diana*, whose rate of steaming was known, and partly from excursions by land and row-boat, all aided by numerous bearings, while the *Diana* was in these parts, before landing me at Ashe inlet. The general position was fixed from astronomical observations by Captain Whiteley of the *Diana*.

I had no assistant, and the duties of a geological surveyor on an undertaking like the present one were of a varied character, consisting, among other things, of a general superintendence of the sailing of the craft; judging what was best to be done under the constantly changing conditions, by watching the wind, tide, currents, etc.; making the track-survey by the above methods; taking observations for latitude, longitude and magnetic variation; making tidal observations, notes on the topography, on the dip or strike and character of the rocks, on glacial phenomena; taking the heights of mountains, waterfalls, etc.; photographing; collecting, preserving, and packing geological, botanical, and zoological specimens, etc. On land journeys, other labours were necessary in order to make good progress. I had an intelligent native guide, who understood some English, and every spare moment on the yacht was utilized in constructing a vocabulary of the Eskimo language, which I was afterwards able to check by the help of an educated young half-breed belonging to the same people. In doing this, I had an English dictionary before me, and I selected all the more important words in their proper order.

As most persons know little about Baffinland, it will be desirable to give a short general description of the country before mentioning the

results of my own investigations. Baffinland is a large island on the west side of Baffin bay, or opposite to Greenland. It stretches from Hudson strait, north-westwards through twelve degrees of latitude, or from 61° 40′ to 74° N. It is the third largest island in the world, being only exceeded by Greenland and Australia. Its total length is 1005 English statute miles, and its breadth varies from 200 to 500 miles, the average being 305. The area is, therefore, about 300,000 square miles, or about ten times that of Scotland or Ireland. It forms, however, only about one-tenth of the superficies of the Dominion of Canada. Notwithstanding its immense extent, it appears to be of no great value, since it is composed, as far as we know, of barren rocks, partly covered with ice.

It was formerly supposed to consist of a number of separate islands, called Cockburn island, Baffin's island, Cumberland island, Fox Land, Meta Incognita, Sussex island, etc., but it has been pretty satisfactorily ascertained that these are all united, and form the great island now known as Baffinland. The south-eastern part was discovered by Sir Martin Frobisher in 1576, and in 1578 it was named Meta Incognita by Queen Elizabeth. Captain John Davis discovered the land around Cumberland sound in 1585, and Captain William Baffin found the northern part of the island in 1616. The present designation is not new, for in 1821, Sir W. E. Parry proposed it for all the northern part, in honour of Captain Baffin, who was regarded as an able and enterprising navigator. From the above-mentioned dates, it will be seen that all these lands formed part of the British possessions on this continent, by right of discovery, dating from 183 to 143 years before our acquisition of Canada. They were formally transferred to the Dominion, along with all other islands lying north of the mainland of America, by an Imperial order in council on September 1, 1880. These circumstances give us a good enough title, so that it was not necessary to "raise the flag" to assert that they belonged to the Empire, as was done on the occasion of the visit of the *Diana* to Cumberland sound in 1897.

Baffinland has a generally bleak, mountainous, and barren aspect; but on the west side there is an extensive low and comparatively level area, underlaid by horizontal Silurian limestones, stretching inland from Fox basin to the great lakes of the interior. A similar area, underlaid by the same kind of rocks, occurs at the northern extremity of the island. Dr. Franz Boas spent the years 1883–84 in Baffinland, and in winter he travelled extensively by dog-sleigh all along its north-eastern side. We are indebted for most of what we know of these parts to his observations and maps, published in 1885.* According

* Dr. A. Petermann's "Mitteilungen aus Justus Perthes Geographischen Anstalt, Ergänzungsheft," Nr. 80. Gotha, 1885.

to these, the mountains form three principal ranges, all trending north-west, or parallel to the longer measurement of the island. The highest runs along the north-east coast, facing Baffin bay; the middle range is between Cumberland and Frobisher sounds, while the third, or southern one, extends along the north-east side of Hudson strait from Resolution island to Fox basin.

Northward of Cumberland sound, the broad north-eastern range forms a great plateau from 5000 to perhaps 8000 feet in height, covered with a cap of ice, resembling the similar covering of Greenland, while the valleys in the remainder of the range to the northward (probably not quite so high) are filled with ice, which, in some cases, descends as glaciers to the sea. The higher parts of the middle range may be from 2000 to 3000 feet above the sea. The southern range, as far as it can be seen from Hudson strait, appears to be from 1000 to 2000 feet high. The actual measurements which I made of some of the hills of this range were confined to the middle portions, where they are lowest, the highest parts being towards both the south-eastern and north-western extremities.

The summit of that part of the southern range lying between Hudson strait and Frobisher bay is covered by a long smooth-topped cap of ice, forming the Grinnell glacier. The dimensions of this glacier are not accurately known, but the length is somewhere between 70 and 100 miles, and the breadth may be about 20 miles. The Eskimo call it Ow-u-i-ta. The charts, which are very imperfect, represent it as discharging into several of the inlets on the south-west side of Frobisher bay. The Eskimo described to me one discharge of this kind, called Pakaluia, not far to the north-westward of Gabriel strait, and they stated that the bergs that float up the north side of Hudson strait, and which are all small, come from this locality.

In connection with the existence of this great glacier in the extreme south of Baffinland, the question may be asked, why there are no glaciers further up Hudson strait, on Southampton island, or in any part of the Labrador peninsula. This fact is probably owing partly to great local differences in the amount of precipitation, and, in the case of the northern portion of Labrador, to the circumstance that the mountain range near the sea is too narrow and steep to retain even the relatively small quantity of snow which falls upon it. Further inland the country is much lower, and is mostly wooded. Throughout the northern part of the Labrador peninsula there appears to be less snow than in the regions further south, and consequently the material is not present for the creation of glaciers. In these latitudes, the amount of snowfall is, no doubt, largely influenced by the temperature of the adjacent sea during winter. The ocean current, impinging on the east coast of Greenland, flows around its southern extremity and up the west coast; then it crosses to the Baffinland side, and a part of it finds its way up

the north shore of Hudson strait, and this crosses to the south side, in the western part, and flows out along the southern side, where the current appears to run constantly eastward. On the northern side of the strait, at each tide, the current flows longer to the west than to the east. This is easily seen by the movements of the small icebergs which occasionally pass up on this side. In Greenland, the high land, together with the ocean current, having some degree of warmth, which has just been mentioned as flowing round the southern part of the great island, afford very favourable conditions for the accumulation of its enormous glacier. The same current, passing down the eastern coast of Baffinland and around its southern extremity, furnishes the necessary marine conditions, while the extensive high lands adjoining the sea in these parts allow the heavy snows of winter to accumulate. On the other hand, the cold sea surrounding the Labrador peninsula, the dry winter air of the interior, and the moderate elevation of the land, all combine to prevent the formation of glaciers south of Hudson strait.

The country, for a long distance inland from the south side of Hudson strait, is not wooded, except at the bottom of Ungava bay, and consequently driftwood is almost absent from the greater part of this shore. The northern part of the east coast of Labrador is also destitute of timber, and there the ocean current flows south. No trees of any kind grow in Baffinland. The set of the currents in Hudson strait would render it impossible for driftwood, even if present on the south side, to cross to the north shore, yet trunks of small spruce trees are not uncommonly stranded at high-water mark all along the latter. Whence has this wood come? The only answer appears to be that it has been brought by the current, which, after flowing round Cape Farewell and across Baffin bay, passes up this coast. In that case, its original source would probably be in some of the rivers of northern Siberia, from which it would be carried by the current that Dr. Nansen describes as flowing thence across the polar region and on towards Greenland. Some of these small trunks have the long butt due to having grown in alluvial soil, where the tree threw out fresh roots above its original ones, on account of the accumulation of silt around its base. This circumstance also points to the earthy banks of the Siberian streams, rather than the rocks of Labrador, as the birthplace of these trees.

During the Tertiary period, all the land in the north-eastern part of North America is believed to have stood at an elevation of several thousand feet above the present levels. At that time the site of Hudson strait and its continuation, Fox channel, formed a land valley, extending from the south side of Melville peninsula to the Atlantic ocean, a distance of fully 700 English statute miles, with an average breadth of 100 miles or more. It probably contained a great river, which had numerous large branches traversing what is now the bed of Hudson

bay, and converging in its north-eastern part. The bottom of this great inland sea is very level, and in most of its area it is covered by less than 70 fathoms of water. Few soundings have been recorded in Fox basin, and it is likely to prove even shallower than Hudson bay. The submerged valley of Fox channel and Hudson strait deepens as it goes towards the ocean, and gives soundings of 340 fathoms and upwards before intersecting the present line of the Atlantic coast.

After the close of the Tertiary period, the elevated land on either side of Hudson strait became covered with ice. A study of the glacial striæ of these regions shows that in Baffinland, to the north of the great depression, the ice moved southward and fell into it, while to the south, in Labrador and the northern part of the present bed of Hudson bay, it moved northward to the same huge reservoir. The ice from both

TYPICAL VIEW ON SOUTH COAST OF BAFFINLAND.

directions, which thus came together, filled the wide valley and moved eastward or down-grade to the ocean, as shown on either side, by the forms of the glaciated rocks, the directions of the striæ, and the composition of the drift.

Lakes appear to be scattered everywhere among the mountains in southern Baffinland, but there is what may be specially designated a great lake region in the central part of this half of the island. Two of the lakes which occur there are worthy of a short notice. The southernmost, Lake Amadjuak, which I visited, may be 120 miles in length by 40 in breadth in the middle, with an elevation of about 290 feet above the sea. It lies in a north-west and south-east direction, between the southern and middle main ranges of mountains, already described. When I first came in sight of this lake, not far from its central part,

it was bordered on the south-west side by a generally level plain, dotted with hummocks of Laurentian rocks, which also partially surrounded Lake Mingo, 15 miles in diameter, and lying quite close to Lake Amadjuak. Immediately overlooking these plains, the north-eastern side of the southern range rises, rather abruptly, to a height of 700 feet, or 1000 feet above sea-level. From the top of a hill, which I called Mount Mingo, 966 feet, by barometer, above the lake of the same name at its base, some high points, covered with snow, were visible a long way off to the east in the mountains of the middle range on the opposite or north-east side of the big lake.

According to native accounts, Lake Amadjuak discharges northward into Lake Nettilling (which may be 140 miles long and 60 miles broad) by a short river with no rapids, and up which the Eskimo can paddle their kyaks; and Lake Nettilling drains into Fox basin by a large and somewhat rapid river, with a course of 50 to 60 miles, and it must therefore have an average descent of about 5 feet per mile. My guide said the name of this stream was Nowata, but on Dr. Boas' map it is called Koudjuak. Both of these great bodies of water are larger than any lake in the whole peninsula of Labrador, which measures 1000 miles each way, and they may almost be compared to Lake Ontario in extent. The Eskimo informed me that the country is level about the north-western half of Lake Amadjuak and all around Lake Nettilling; also from both these lakes to Fox basin. The name Nettilling means "flat-floor." Reindeer are plentiful in summer on these wide plains, but in winter they go into the mountains. As already mentioned, this level country is no doubt underlaid by horizontal limestone. A corresponding low tract of similar limestone occurs in the eastern part of Melville peninsula, on the opposite side of Fox basin. Mansfield island is formed of flat-lying grey limestones, and these I found to contain fossils of the Niagara formation. Drift fragments of the same kind of limestone coming from the country on the east side of Fox basin, contain fossils of this formation, and I have no doubt the rocks of the two regions are correlated. At the head of Frobisher bay, and on its south-eastern side, is an isolated hill of limestone, shale, and marl belonging to the Trenton or Galena formation of the lower Silurian system. It is called Silliman's Fossil mount, and has afforded over seventy species of fossils, many of them new to palæontology, but, as a whole, they correspond to the Manitoba and Minnesota fauna of this horizon, rather than to that of the Trenton in the Ottawa and St. Lawrence region. Other isolated patches of these rocks and one outlier of the Utica or next higher formation occur in other parts of Frobisher bay.

The general appearance of Baffinland, as viewed from the sea, is mountainous, rugged, bleak, and barren. Bare black-looking rocks are almost everywhere in evidence, both along the coast and on the sides and crests of the mountains. But on going inland in the middle of

summer and looking over the country from a height, this appearance is somewhat relieved by green-bottomed valleys, where grasses and sedges grow among the stones, and also by occasional patches of dwarf vegetation on the hillsides, and here, on a sunny day, we may find many bright arctic flowers of various colours. The general blackness of the rocky landscape is sometimes varied by white spots and long narrow banks of snow on northern slopes sheltered from the sun's rays. Beautiful blue lakes may be seen here and there at different levels among the mountains. The clear brooks and small rivers which discharge the waters of these lakes from one to another, are almost sure to end in fine cascades when they plunge over the last ridge into the head of some inlet or bay. I collected over a hundred different species of plants, and, if time had permitted, probably a good many more might have been found. The general dark appearance of the rocks is due to a growth of lichens on their surface.

Returning to the subject of my own journey in 1897. After the yacht had been launched in Ashe inlet, Big island, on July 20, we were obliged to remain for a day at anchor at the head of the inlet on account of a strong head wind. There was no darkness at that season, and we sailed at two o'clock next morning. We had only gone a few hundred yards, when the sound of a human voice, from a long distance behind, reached us in the calm northern air. We immediately put about and dropped the anchor. With a couple of men, I rowed back in the boat, following up the direction from which the sound was coming. At length we saw a big Eskimo man standing on a rock at the edge of the water, with his gun on his shoulder, but carrying nothing else. As we approached, he greeted us like an old friend, and pointed out the way for us to come to the rock he was upon. As soon as we touched it, he jumped into the boat as if he belonged to the party, and showed great delight in joining us. He had been out hunting till late the previous evening, and had lain down for a nap near our anchorage. The noise we made in getting under way had wakened him up. On reaching the yacht, he was the first to climb on board, and he immediately made himself quite at home with us. He was demonstrative, talkative, and bubbling over with good nature. Unlike an Indian, he was anxious to show us how much English he knew, and I was glad to find he could understand us fairly well. He said he was familiar with the whole coast, and had also travelled in the interior. I told him I was going a long way up the strait, that I might be away two moons, and asked him if he would come with us as guide. He joyfully accepted my offer, and began at once to make himself useful. Towards the middle of the day, the ice blocked our passage so completely that we were obliged to turn back. Our guide, whose name was Twimi, now advised us to go round the eastern extremity of Big island, and said we would find but little ice in the north channel. The evening was beautiful, with a

light fair wind, and as soon as we had rounded the east point, we came upon a large camp of Eskimo. They surrounded us in their kyaks and omiaks and regarded us with the most unaffected friendship, both the men and women shrieking and cheering with delight, like so many children made suddenly happy. I now discovered that Twimi's family, consisting of his father, mother, wife, sister, and several children, were among the party camped here. I told him to go ashore and get what things he might require for his journey, and to rejoin us at some islands which were in sight a few miles off, where I intended to anchor for the night, in order not to be troubled by our new-found friends. He was afraid to quit the yacht, however, in case we might sail away and leave him behind, so he asked a couple of young men to come after us in their kyaks with certain articles which he enumerated. I was glad he had had this chance to communicate with his family, whom he had never mentioned to us. If we had succeeded in passing up the outside of Big island, they would have had no means of knowing what had become of him until he could find them on some of their wanderings after his return.

During our entire cruise we tried to find a harbour every evening, but did not always succeed in doing so, and consequently we spent some anxious nights, watching the movements of the ice and the rushing tides. By constant vigilance we managed to escape any harm, and we brought back our yacht without its having suffered the slightest damage. The whole coast is well supplied with good harbours. In the course of our explorations we discovered twelve, roomy enough for large vessels and affording complete shelter with convenient depths of water and good holding-ground in every instance. Sketch-charts of several of these were made and lines of soundings run, which may be of use some day if Hudson strait should be utilized for navigation to a greater extent than it is at present.

From Big island to Fair Ness, the outer ridge of the southern range skirts the sea-coast. This section is remarkable for six great bands of coarsely crystalline white Laurentian limestone which are here exposed. At 12 miles north-west of the extremity of Big island, a narrow entrance leads into Crooks inlet, which is from 3 to 4 miles wide and extends for 20 miles into the land. Good sections of five of these bands may be seen in this inlet, the bluffs and hills on either side consisting of these rocks together with gneiss in about equal proportions. The dip here and elsewhere along the coast is almost invariably inland or to the north-east. Twelve of these enormous limestone bands, besides numerous smaller ones, were met with between Icy cape and Charkbagh, and I have calculated that their aggregate thickness may amount to the enormous total of 30,000 feet. One of them, which comes to the coast at Wharton harbour, is better exposed than most of the others, and I estimated its thickness at 5700 feet, or upwards of a mile, and yet it

may not be the thickest of these immense bands. The facts I was able to ascertain prove that these limestones extend from the Lake Amadjuak route to the head of North bay, a distance of 130 miles by a breadth of 40 miles, and from their trend it may be inferred that they will continue south-eastward and come out successively to the shore of the strait at different points between North bay and the Middle Savage islands. In no other part of Canada, nor in the United States, has such a volume of these limestones been found. They go far to prove that the newer Laurentian rocks are a sedimentary and not a foliated granite series.

Behind Fair Ness is a bay running back 20 miles from the ness, with a length, parallel to the strait, of 25 miles, which I named Markham bay. It contains many islands and points, and along its north-east

HEAD OF NORTHERN INLET, NORTH BAY, BAFFINLAND.

shore the land is lower than elsewhere on the north side of the strait. The coast is also comparatively low to the northward of Big island. From Markham bay, for 100 miles north-west, the main shore is bordered by an archipelago of islands about 25 miles broad, embracing all sizes, from mere rocks up to 10 miles in length. They seem to be innumerable, and there must be many thousands of them. As a rule, the islands are smaller and more widely scattered towards the outside of the archipelago, and progressively larger, higher, and closer together, as we approach the solid land. In going towards the main shore, it is impossible for a stranger to distinguish the islands from the continuous land. The former become larger and higher, and the channels between them narrower and narrower, until at length they terminate among the hills without connecting to form islands. The condition may be best understood if we imagine a rugged country, like that behind this coast, and

having a general descent to the south, to be continued under the water of the strait till it is half submerged.

My longest journey inland was the one made northward from the head of Amadjuak inlet or fiord, to the shores of Lake Mingo, close to Lake Amadjuak. We found a perfect and easily accessible harbour at the head of the fiord. The Alice river dashes into it by a foaming rapid past the foot of an isolated conical hill. This river forms the connecting links between the various lakes of the chain in a valley leading in the direction we wished to go. Leaving the yacht in charge of two sailors at the harbour, I started on foot with the other two seamen and my Eskimo guide, who said he knew the way to the big lake. After we had gone part of the distance, we found that he had been over the route only by kyak, which he "portaged" between the lakes, and in trying to steer the best course by land, he was sometimes at fault. The men's packs were comparatively light, as we did not expect to be gone more than a week. They contained a tent, blankets, cooking-outfit, and provisions, whilst I carried what instruments were required.

The hills were rugged, steep, and covered with boulders, and we found the best walking along the bottoms or sides of the valleys, especially where these were terraced. But in following the margins of the lakes, it was annoying to find our way occasionally blocked by a precipice, or a bluff with deep water at the foot. This necessitated climbing up high steep hills, and sometimes making a considerable *détour* before we could resume our march in the valley. In some places, on the sides of the valleys and elsewhere, rounded boulders of gneiss were piled in the form of ridges and small hills without any fine material among them. At a few localities I saw good examples of osars, or ridges of sand and gravel without any boulders. Well-marked terraces at various altitudes, up to more than 400 feet above the sea, occurred here and there all along the valley of the Alice river. Marine shells of a few common northern species were found in several localities in the drift of this valley up to an elevation of 110 feet above sea-level. At one place the bouldery clay containing these shells had been disturbed by ice-pressure, showing that here there had been two periods of glaciation. We left the main valley of this river at Stevenson lake, and crossed the hills north-westward to Gilbert lake on one of its branches, a distance of $2\frac{1}{2}$ miles.

All the streams flowed towards Hudson strait till we came near to Winchell lake, when they began to run northward in the direction of Lake Amadjuak. The last body of water before reaching Lake Mingo, and which I called Walcott lake, lay directly across our course. It has an elevation of 243 feet, by barometer, above Lake Mingo, and nearly the whole of this descent is in a single cascade at its outlet, which falls directly from a notch at the level of its surface and at right angles to its straight northern side. We were obliged to go round to

the east end of this lake, and from it we crossed the high rocky hills to the northward. At the top of the one which I called Mount Mingo we obtained a fine view over Lake Amadjuak, on which no white man had ever before gazed. On descending to the shore of Lake Mingo, which lay at its foot, carrying with me two good barometers, I found the height of the mountain to be 666 feet. By a comparison of elevations, that of Lake Mingo would be about 300 feet above the sea, and the mountain would therefore be 966 feet above the same level. Lake Amadjuak was estimated to be about 10 feet lower than Lake Mingo. From the top of Mount Mingo I took several photographs, giving a panoramic view of the lakes and the plain between them. The north-east side of Lake Amadjuak could be seen in the dim distance, and I estimated its width to be at least 40 miles, and it may be considerably greater.

In our weary walk along the stony margins of the chain of lakes which we followed, varied by *détours* over the high rocky hills in order to reach Lake Amadjuak, I could not help wishing for a canoe, by which the journey would have been accomplished with greater ease and in less time. Travelling by this means, only about six rather short portages, and one of 2½ miles, would require to be made, as may be seen by the accompanying map, in order to go from Amadjuak harbour to the lake of the same name.

On our return journey, we took a more western route from McGee lake to Greeley lake than the one we followed in going, and thus we passed by several lakes we had not before seen; but the general character of all these sheets of water is much the same. The banks are sloping and covered with stones and boulders, having a growth of coarse grass among them, while craggy mountains rise everywhere just behind. The heights of the principal ones we passed over on either side of the Alice river varied from 1050 to 1150 feet above the sea.

In two of the valleys we crossed I saw miniature glaciers, but in each case they had evidently been formed by the continued freezing of the overflow of a stream choked by the frost, so that in the course of the winter, or perhaps of several winters, a great accumulation of ice had taken place. In summer these streams had cut canyons completely through the ice, and were flowing among the boulders underneath it.

An interesting feature in the physiography of this region was the great number of sparkling rills of the clearest water which crossed our path along the sides of the valleys. Sometimes, for miles, we would pass one of these rivulets at every few hundreds of yards. They ran down the slopes in trenches or little channels cut in the drift with a regular flow, gurgling over clean red, white, and grey pebbles and cobble stones, and tempted the perspiring traveller to

drink the ice-cold water oftener than was good for him. The source of all this water seemed to me to be from the steady thawing of the deeply frozen ground, or of the ice among the drift on the higher levels during the summer weather.

I took the temperature of six of the lakes we visited by a tested Cary thermometer, with the following result: Orton lake, August 11, 50° Fahr.; Walcott lake, 14th, 51°; Lake Mingo, 14th, 48°; Merriam lake, 17th, 50°; a bouldery lagoon off Greeley lake, 17th, 58°; Gertrude lake, 18th, 50°. The high temperature in the lagoon, which was at the mouth of Boulder river, was due to the fact that the water, for some distance above it, spread among a wide and even field of boulders, all of which became heated in the sun, and so warmed the water, and also to its exposure in the quiet shallow lagoon itself. We happened to halt for our mid-day meal at this place, and while it was being prepared, I took off my clothes and plunged in for a bath, to the great delight of the Eskimo Twimi, who had never before seen a human being swimming. The whiteness of my skin and the frog-like movement of my body interested him immensely, and he inspected me with child-like glee, first from the top of one big boulder and then from another.

Our method of cooking will interest any one who may contemplate a trip like ours in any similar subarctic region. At our first camping-place, the two sailors and I went off to collect any dead stems we could find of the root-like or creeping dwarf willows, in order to make a small fire to boil our kettle. On our return, Twimi said they were no good. He had in the mean time built a little chimney of stones, taking advantage of an angle in the rocks, and after collecting an armful of the large growing tufts of a heath-like plant, very common everywhere in these parts (*Cassiope tetragona*), he made them burn in his chimney, sending a strong flame out at the top. By feeding it in as rapidly as it consumed, from a heap with which we supplied him, he soon made our kettle boil at the top of the chimney. A knowledge of the fact that this plant may be thus utilized in a green state, in fine weather at any rate, may save travellers carrying an unnecessary quantity of alcohol as fuel. There is a slight objection to its use, from the fact that a sticky gum from its smoke condenses on the outside of your kettle or pan.

We got back to the yacht on the eighth day after leaving, or on August 18, having spent four days in going, one day round Lake Mingo and three days in returning. Two days were rainy and six were fine, and during the latter both mosquitoes and black flies were very troublesome. Lake Amadjuak proved to be about 50 miles from our harbour. My record of distances was kept principally by pacing and time estimate, but four latitudes were also taken by sextant. I obtained a considerable number of photographs on gelatine films, which served to illustrate all phases of the scenery.

On my return to Amadjuak harbour, I found the fiord nearly clear of ice, and we left immediately to resume the survey of the coast to the north-west. We reached Charkbagh fiord, said to be the longest inlet on the north side of Hudson strait, on August 22, and I judged it best to turn back the next day in order to be reasonably sure of keeping my appointment to meet the *Diana* at Ashe inlet, on September 10. On the way back I made a track-survey among the islands lying outside of those we had been among going up the strait, and we anchored again in Ashe inlet on September 1. During the interval between this date and the 10th, I surveyed North bay nearly to Icy cape, and returned to the inlet in time for the *Diana*, which sailed with us for St. John's, Newfoundland, on September 12.

LOOKING UP CANYON INLET, BAFFINLAND.

Our general experience during this yachting cruise on the southern coast of Baffinland may deserve a passing notice. As a rule, the weather was fine—too fine, perhaps, as there was much dead calm, which hindered our progress. It, however, also included fogs, high winds (sometimes amounting to gales), rains, and some decidedly cold spells. Although on calm, sunny days we found the weather quite warm inland, on the sea there was a constant feeling of cold or rawness and discomfort, on account of the presence of so much ice.

The tides in Hudson strait are very high, being fully 30 feet at Big island, and considerably more at the head of Ungava bay; but at the entrance of Hudson bay they become, all at once, very moderate, owing to the pent-up water being relieved by the sudden expansion into Hudson bay to the south, and Fox bay to the north. Near the shore the difficulties incident to the great rise and fall of the water

are increased by the velocity and uncertainty of the currents generated by the high tides. The different depths and directions of the channels among the islands and the irregularities of the coast give rise to cross-currents running to all points of the compass, races, tide-rips, and a very rough sea when much wind is blowing. The time over which my experience extended was so short that it did not enable me to find the hour of high and low water. The sluggishness of the common compasses, which were all we had, and the great amount of the declination, varying from 57° to 64°, caused much inconvenience, both in navigating and in making the track-survey. Our difficulties with the ice, as well as the tidal currents, apply, of course, only to the coast, and do not in any way bear upon the question of the navigation of the main strait by large vessels. At the same time that the whole width of the strait outside of the islands is quite clear, the ice may be lodged here and there in the fiords and among the islands all along the north shore. In sailing in a small craft in these parts, the swift currents, just referred to, bring the ice down upon you in the most extraordinary manner. The ice-pans appear to drift capriciously backward and forward, and, without any apparent cause, they will select some unexpected course and insinuate themselves into an open bay, harbour, or channel. You may be comfortably anchored for the night, and congratulating yourself on your good luck, when you will see a pan of ice gliding rapidly into your harbour, soon followed by another, and this by many more, until, in less than an hour, your snug shelter is filled up and you are a prisoner, in danger of being pushed upon the rocks. With very little wind, you may be barely keeping ahead of an ice-field following you up, when all at once you see another coming across from one side to intercept your course. You turn to avoid it, and soon meet a third, running from some other direction. Sometimes it is a race between you and a grinding field of ice to reach a gap, by which you hope to escape into open water beyond, before the narrow space is blocked up.

Little is known of the fish of Baffinland. As before mentioned, the cod is said by the Eskimo to abound in Frobisher bay, as it does around Cape Chidley, and Dr. Boas mentions a place much further north, to which the natives resort to live upon this fish for a certain period. The cod also occurs in Hudson bay, as proved by myself in 1877 and by Mr. Low in 1899. In 1880, I found a small halibut floating on the surface in the straits. Sea-trout enter the mouths of nearly all the streams, and we saw speckled trout jumping in the lakes of the interior, but salmon do not seem to frequent the north side of the strait. In 1884, I dredged in from 20 to 40 fathoms at Big island, and found pretty much the same aggregation of crustaceans, mullusks, and radiates as we get at corresponding depths in the gulf of St. Lawrence. Several species of marine mammals, some common and some rare, are to be

found on the north side of Hudson strait, among them being the walrus, the narwhal, and the polar bear, the Greenland whale, the bottle-nose, the fin-back, and the little white whale, besides two or three other cetaceans. The seals of this coast include the bearded or square flipper, the Greenland or harp, the fœtid or ring seal, and the harbour seal, and other species are said to be taken occasionally.

The terrestrial mammals of Baffinland are confined to a few species, among them the reindeer, of which single individuals were seen everywhere we went; but the greater number of these animals move about in herds, and are found in different districts at different seasons. The other mammals are the arctic hare, the wolf, the white and the blue fox. The red fox and its varieties are not found in Baffinland, although common on the south side of the strait. We sometimes saw a mouse or mole darting from the shelter of one rock to that of another, and it is probable that the foxes subsist mainly on these; but I saw no evidence of the existence here of the large yellow-cheeked meadow mouse, which is abundant on the west side of Hudson bay. Some of the Eskimo we met knew about the musk-ox, and said it lived in the northern part of the island. Of the few birds we saw in the interior, ravens, arctic loons, rock-ptarmigans, and snow-birds were the most frequent. The black guillemot was common, and the least auk rare on the coast. The trumpeter swan and the common eider breed on Nottingham island. At Charkbagh I saw two large flocks of Canada geese flying due south on the night of August 22, but this bird was not seen further east.

Although the air was always cold on the water, by going a few miles inland, on a bright day, one found quite a different atmosphere, and the comforting sense of warmth in the pure air was quite exhilarating. If calm, the flickering appearance of the heat over the rocks was more manifest than in the regions further south. In the bright sunshine the arctic flowers of many hues would be all wide open, and little butterflies of various different species could be seen flitting about in considerable numbers, making the most of their brief time for enjoyment. Of all insects, the lepidoptera were most in evidence, and I collected fifteen different species. Besides these, black flies, mosquitoes, and two species of bumble-bees were the only insects noticed. On such excursions one missed the elsewhere familiar grasshoppers and crickets, dragon-flies, beetles, ants, and other insects. It is an interesting fact that Mingo, the name of one of the large lakes, means "ant," and it is possible that ants may be found on the plains around this lake, which is far away from the cold sea-air. In the lakes and streams, no larvæ of insects, no shells, no crayfish or frogs or newts, are to be seen, and on the land there are no toads, snails, slugs, or spiders.

The absence of birds of prey, swallows, singing birds, and squirrels

is also noticeable, and contributes to the feeling of solitude one experiences in this treeless region.

The Eskimo are not numerous in Baffinland. From what I could see and learn in 1897, the total native population of the south coast and southern interior is only about 170, while that of the west or Fox basin side may amount to one hundred more. The bulk of the population on the eastern side of the island has gathered at the two whaling stations of Kekerten and Black Lead in Cumberland sound, where many of them are employed. According to the report of the commander of the *Diana*, they numbered about 400 in 1897. This would give a total population of about 670 for the whole of Baffinland.

ESKIMO KAYAKING NEAR AMADJUAK BAY, BAFFINLAND.

The old tradition that the Eskimo are a people of small stature still obtains in some quarters, but is without foundation. On the contrary, in Labrador, Baffinland, and all around Hudson bay, the height of the men is probably above, rather than below, the average of the human race; but, as a rule, the women, although very strong, are considerably shorter than the men. We always found these people honest, cheerful, frank, and friendly. They are brave, industrious, provident, and communicative, in all of which characteristics they contrast with the northern tribes of Indians. Their skins are often greasy or dirty, because it is difficult to have them otherwise in cold weather and in the absence of soap or warm water or anything to serve as a towel, and because, for ages, custom and good form never required anything else; but wherever they have been shown the use of soap and can obtain it, nothing pleases them more than to wash themselves.

They eat most of their flesh, fowl, blubber, and fish in the raw state, not from choice, but necessity, for they can seldom obtain either vessels or fire for cooking. But when they own a kettle or pan and can procure wood, they cook their meat, and enjoy it much more in this form. At the end of our explorations, when I had paid Twimi (in hardware, ammunition, etc.) for his services, and we were about to steam away in the *Diana*, he thanked me for having paid him so much, but more especially for the bountiful meals of hot cooked food we had given him every day while he had been with us.

Before the reading of the papers,* the PRESIDENT said: This Society is so closely connected with the Antarctic Expedition that I will read a telegram which has just arrived from Dr. Nansen: "The Conference of the International Investigation of the Sea, now meeting in Christiania, expresses its goodwill towards the British Antarctic Expedition, and sends best wishes for its success.—NANSEN, President."

We have two papers this evening relating to the very northern part of North America, one by Dr. Bell, who is well known to us, who has just succeeded our gold medallist, Dr. George Dawson, as director of the Geological Survey of Canada, and the other by his nephew, an extremely promising geographer and geologist, Mr. Bell. Dr. Bell's paper is on the south part of that great island, Baffin island, the great mass of land opposite Greenland on the western side of Davis strait and Baffin bay. The other paper is on the region so well known to us as having been traversed by Sir John Franklin and others, the country between Great Bear lake and the Arctic ocean on the northern coast of North America. I regret that both the authors are absent. We had hoped that Mr. Bell would have been here, but he was telegraphed to, to return to Canada, and therefore I will read you an abstract of the papers.

After the reading of the papers, the following discussion took place :—

Mr. J. G. COLMER: You have asked me to address the meeting, but your request has come upon me rather suddenly. I did not know that I should be called upon to speak at all, and I rise naturally with some diffidence, because I know nothing personally of the region about which we have heard such interesting matter this evening. But I am not ashamed to make that statement, because we all know Canada is a very large country. I have been over a good deal of it myself, but I have never had the good fortune to visit those far northern regions which Dr. Bell and his nephew have described. I have read about them from time to time, but although I have not been there, I have the pleasure of knowing Dr. Bell very well, and also his nephew, and many other members of the Canadian Geological Survey to which they belong; and am aware also, as are many members of the Geographical Society, of the very valuable services they have done in exploring the less accessible parts of Canada. Their reports are published annually, and are looked forward to with very great interest, and to my own knowledge several very interesting papers have been read in this hall from time to time about many parts of Canada with which we are not many of us very familiar. I cannot speak of the Geological Survey of Canada without mentioning the name of one who was well known to us, Dr. Dawson, and whose recent death is a loss to geographical science all over the world. Like many others, I came here to-night to obtain information rather than impart it. I think I shall be expressing the feeling

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* A paper by Mr. Mackintosh Bell on Exploration in the Great Bear lake region was read at the same meeting; it will be published shortly.

of the meeting when I say we have all been very interested in the papers by Dr. Bell and Mr. Mackintosh Bell, illustrated as they have been by the admirable photographs; and I am sure Dr. Bell and Mr. Bell will be highly gratified by the reception accorded to their papers. Papers of this kind make us understand practically how little we know after all of the vast territory which makes up the Dominion of Canada. At the present time, although we have a population which the present census will probably show is somewhat in the neighbourhood of six millions, we may say that even yet only a very small fringe of the country is inhabited. There are immense territories which are only partially explored, and we are learning year by year of the riches of Canada and of the various sources of wealth with which the different parts of the country have been endowed. Naturally the principal industry of the country at the present time is agriculture, but we are daily finding new riches in the way of minerals and other resources; and it is a very curious thing that, although we hear from time to time of lands in remote portions of Canada which are described as inhospitable and barren, we are apt to be surprised when in a few years the discovery of gold or some other form of wealth has led to thousands of people congregating in these particular regions. The discoveries in the Yukon and the Klondike districts may be mentioned as instances. I am sure we have all listened with very great interest to the papers we have heard to-night, and I am only sorry that I cannot say more from personal knowledge of the particular districts which have been discussed.

Colonel Church: I scarcely anticipated being called on, from my special field of South America, to speak on the northern part of North America; but I may be able to point out one or two things of special interest. I am greatly pleased to find attention drawn to this region, and more especially by an old friend of mine —Dr. Bell. Year after year Canada pushes her explorations to the north, and with great profit to science and to her own prosperity. If we look at the development which has taken place in Canada, it is surprising to find that it has been almost confined to the southern fringe of the country. Canada seems to be sailing like a badly laden ship—all on one side. The great heart of the country has yet to be touched, and in that great heart, I believe, will be found riches more vast than in any part that has yet been developed in the Dominion. Exploration has been made with a view to reaching Hudson bay from Europe by way of Hudson strait, but it is as yet, I believe, doubtful whether useful navigation can take place there. However, the province of Quebec—and I am subject to correction by those gentlemen who are more familiar with Canada than I am—is now making efforts to reach Hudson bay by rail, and I understand they have before the Government to-day an application for a privilege to run a railway northward, and then to make a little branch to the southern end of Hudson bay, where they can reach about 20 feet of water for several months of the year. The immense wealth, however scattered it may be, can then be taken out to Quebec. Then, if we move westward along the Laurentian range of hills, we find a great forest of spruce and trees of that nature, which is rapidly being cut for the purposes of building and for pulp manufacturing, and a great many mills are being established along that line. All that range, about 1500 miles in extent, is covered by a great wooded belt, and I think has also been found to promise to be very rich in minerals, especially copper and mineral phosphates, and perhaps other minerals of value. At the same time, instead of its being a country lacking in agricultural possibilities, it has also been found, even on the Hudson bay slope, to be very rich in agricultural land here and there. But going west and tapping the very heart of the Dominion northwest of Lake Winnipeg, to Fort Simpson on the Pacific coast, we shall find, perhaps, as fine a wheat-field as there is in the world. I may say it amused me two

years ago at Dover to hear Sir William Crookes starving us to death in the matter of wheat, when there are at least 200,000 square miles of wheat lands west of Lake Winnipeg with a climate better than on the frontier of the United States, and where the snow does not fall so deep, and the prairies are exceedingly rich and fertile. The climatic conditions of north-west Canada are largely due to the Japanese current. It is the northern deflection of the most powerful oceanic river of the world—the equatorial current, which daily moves, from east to west, several tens of thousands of cubic miles of warm water. When it reaches the island district south-east of Asia, it divides and sends a greater part of its vast volume northward. This skirts the Japan coast, where it is known as the Kuro-Sivo current. It then turns eastward, runs south of the Aleutian islands, impinges against the shores of Alaska, and continues south-east along the coast of California. The soft winds which sweep over it cross the Rocky mountains where they are low, and, pouring into the region north-west of Lake Winnipeg, give it a warmer climate than is found on the western section of the Canadian Pacific railway, 5° of latitude further south. In fact, in 56° N. lat. in the Peace river valley, and also at Pori Simpson on the Pacific coast of British Columbia, the climate is not so severe as at Montreal, and at the above port strawberries ripen in June in the open air. The Rocky mountains abreast of Port Simpson have passes under 2500 feet elevation above sea-level, while further south they increase in altitude, and the Canadian Pacific railway has to cross them at about 5000 feet elevation, their general altitude being such that they interrupt the passage of the warm winds from the ocean. It is perhaps worthy of remark that the shortest line that can be drawn, north of the Gulf of Mexico, between an Atlantic port and a Pacific one, is from Quebec to Port Simpson, and that the distance from Liverpool to Yokohama or Shanghai, taking this route, is 800 statute miles shorter than any existing one. Broad statesmanship might regard this fact as presenting a good opportunity for a British answer to the Trans-Siberian railway.

The PRESIDENT: We have now merely to thank the authors of these two papers. And, turning to a purely geographical point, I would mention that Dr. Bell has not communicated a paper to us for the first time. I think it was almost twenty years ago that he gave us a most interesting paper on the capability of the navigation of Hudson bay, and more recently he was here himself and read a paper on the country south of James bay. I think there are few men in Canada who have done so much and laboured so hard as Dr. Bell has for the development of that country. Almost every year we have interesting papers from him in the publications of the Canadian Geological Survey, and I am now glad to congratulate him on his appointment as Director of the Geological Survey of Canada. We all regret very deeply the loss of our gold medallist, Dr. Dawson. I would also point out that, although Dr. Bell has given us this interesting account of the southern part of Baffinland, there is an enormous extent of country absolutely unknown. That part of the coast-line beyond and to the north and west of the point reached by old North-West Fox, in 1635 I think it was, is still absolutely unknown and unvisited, and clearly, from the description that Dr. Bell has given us of the country he has visited and of these vast lakes, one of which he saw, and which was then, I believe, for the first time seen by a white man, we may expect, in a country that is absolutely unknown, most interesting results for future explorers connected probably with the Canada Geological Survey. Dr. Bell's nephew also has done most valuable geographical work in correcting the very erroneous map made by the Abbé Petitot, who certainly communicated to us a most interesting paper, but who appears not to have been very accurate in his survey. I have not the slightest doubt, from what we have seen of young Mr. Bell's paper, that he will walk in his uncle's

footsteps and become a most valuable and accomplished geographer and geologist. They have given us two most interesting papers, and I am sure the meeting will wish me to convey to them a vote of thanks, not only for the papers which they have communicated to us, but for the exceedingly interesting photographs which accompanied them.

NOTES ON A JOURNEY FROM ZEILA TO KHARTUM.*

By OSCAR T. CROSBY.

During the period February to June of 1900, I journeyed from Zeila, in British Somaliland, to Cairo, passing Harrar, Addis-Abeba, Markos (the capital of Gojam), Wombera (the westernmost post of Abyssinian troops on the Blue Nile); thence following closely the Blue Nile to Roseires; thence by boat to Khartum.

It was my good fortune while in Cairo to meet Sir Rennell Rodd, secretary to the British agency, who made my official way easy by letters to Captain C. F. Harold, in Samaliland, Mr. Gerolomato, consular agent at Harrar, and Colonel J. L. Harrington, diplomatic agent at Addis-Abeba. These gentlemen, and Mr. J. L. Baird, assistant to Colonel Harrington, by their helpfulness and hospitality, have given me a store of happy recollections concerning a journey which might otherwise have been painful, and in some part impossible. Were the space in this journal available for personal reminiscences, I should become garrulous in writing of the pleasant days in the club at Aden, the mess at Khartum, the Residency at Zeila, and the compound at Addis-Abeba. I may at least say that in meeting these men who stand as outposts of the Empire, an American may learn much of the secret of Britain's glory.

The caravan route followed as far as Addis-Abeba is now a familiar one; it is not probable, therefore, that anything of interest, from a geographical point of view, could be reported from my notes. Camels were used from Zeila to Gildessa; thence to Harrar, donkeys; beyond Harrar, mules. Arrived at Addis-Abeba, I had resort to the unfailing kindness of Colonel Harrington, through whom the necessary interviews with Menelik were arranged, and permission obtained to complete the journey as above outlined.

I felt particularly satisfied with the route chosen for getting out of Abyssinia, since it carried me through a considerable area in the western part of Abyssinia; thence through a sort of "no-man's-land," between Abyssinia and the Sudan; thence to the easterly post of the Sudan, a region not heretofore traversed by a white man. As the difficulties actually encountered were not considerable, I presume the failure to have visited earlier this portion of the course of the Blue Nile has been due to two causes; first, that, as to the Abyssinian region, there has been

* The illustrations are from photographs by Mr. John L. Baird.

some jealousy on the part of the natives because of the existence of gold-fields, and I believe, further, because in this region, later than elsewhere in Abyssinia, the slave trade has been maintained. As to the remainder of the region in question, the Mahdist troubles account sufficiently for the absence of white men during the recent years which have elsewhere witnessed their appearance in almost all of the heretofore unvisited portions of Africa. So far as I could learn by careful inquiry, the portion of the country not hitherto traversed begins in the neighbourhood of Gomar, shown on the accompanying map, and ends in the region west of the Bolassa. The route from Addis-Abeba to the Muga crossing of the Blue Nile, thence north-westerly past Marcos, to Buri, has been already described by earlier writers.

It may be briefly stated, as to this portion of the journey, that the traveller finds himself continually on the great Abyssinian plateau, at an elevation not much varying from 8000 feet above the sea save when he crosses the deep gorge of the Blue Nile or Abai. The depression here is about 5000 feet, and here, as at other points of this great chasm visited by me, there is a very notable exposure of rocks from bottom to top of the gorge. I regret very much that neither the time available nor the technical knowledge on my part was sufficient to yield valuable results in respect to the very interesting geological inquiries that such a chasm must always suggest. For such slight value as they may possess I have transcribed the notes made at this and other crossings of the Blue Nile, in a footnote.*

* Average angle of descent = about 30°. Six fairly well-defined benches were observed. Important elevation readings are as follows:—

Feet.
9650—Level of plateau before sloping to edge of precipice.
9200—Edge of first sharply defined precipice.
8860—First bench.
8530—Second bench.
7870—Third ,,
7220—Fourth ,,
5740—Fifth ,,
5180—Sixth ,,
4725—Water-level.

On low-water bank, fine river-sand. The lower exposed strata are of dark, rather coarse sandstone. From elevation 5840 to 6300 feet, a layer of soft white stone (specimen not yet tested as to composition), strata substantially horizontal. From 6300 to about 7870, same colour, but texture less uniform. Many boulders show remarkably regular fluted and mottled surface, probably water-marks. From 7870 to 8700, colour darker. From 8700 to 9000, layer of pentagonal stones, about 6 inches across, from 1 to 2 feet (generally) in length, closely compacted, inclination about 15° from the vertical, and slanting upward in a north-westerly direction. Plain at top strewn with small boulders, volcanic, showing many blow-holes. Surface deposit of soil on benches and on river-bank supports thick growth of mimosa, interspersed with sycamore and other large trees.

Same general description applies to descents made at Gomar and at Gum, except that rich-coloured feldspar was noted in large masses, taking the place, it

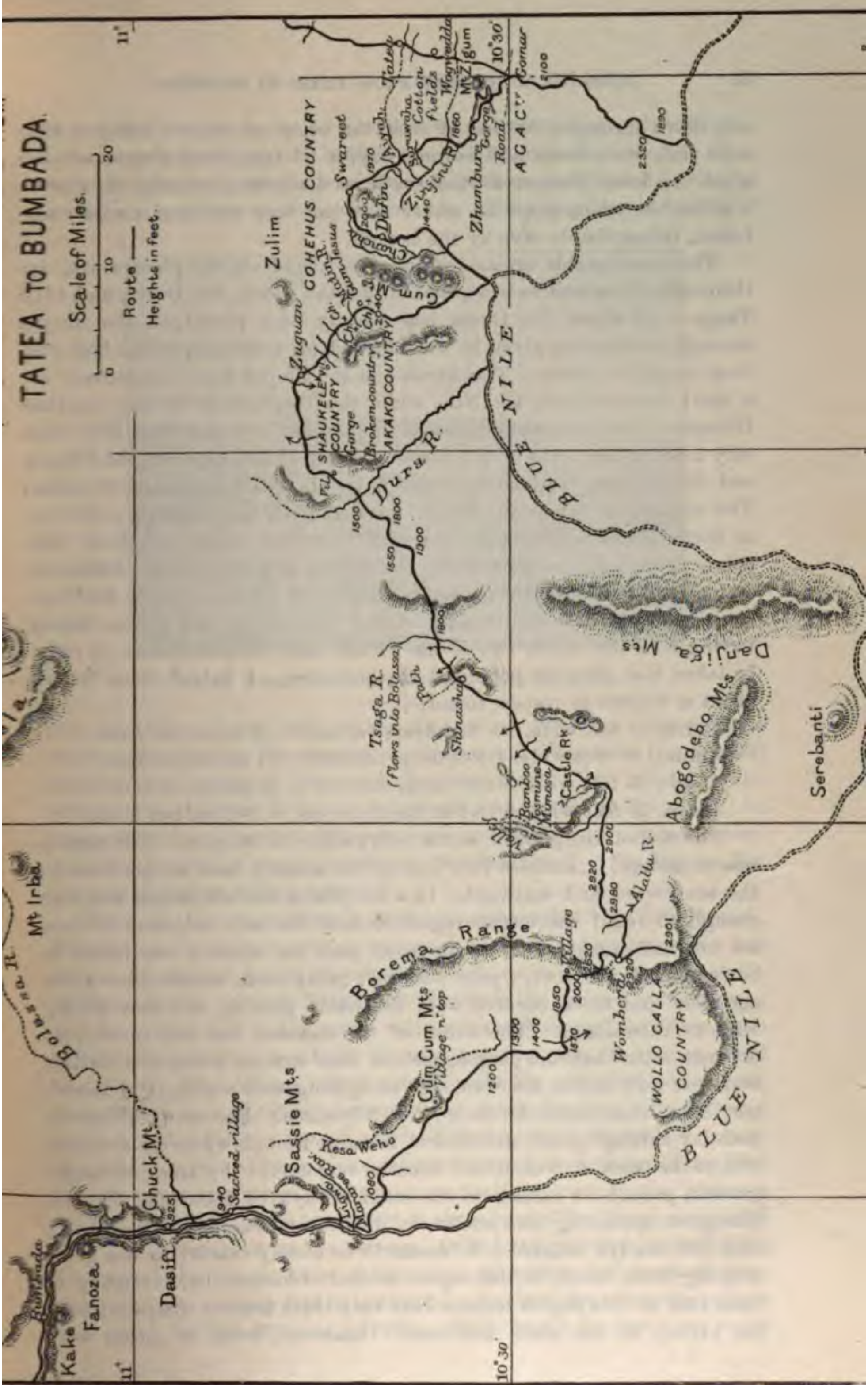
Treating now the region from Gomar westward (see the accompanying map), it is to be noted that the traveller finds the elevation of the plateau slowly diminishing, then again rising to the height generally maintained; arriving at Wombera, he sharply and painfully descends in one day's march, changing his level something like 5000 feet, while covering a distance horizontally measured of not more than 8 or 10 miles. Northward from the line of march, as shown on the map, the depression seemed greater until high elevations were again produced by the rise of the mountains, whose names, as clearly as could be obtained from the native sources, were Bela and Irba.

The plateau seems to have no sharply defined western escarpment beyond the northern point of the Borema range. Beyond this point the slope of the land towards the Bolassa valley makes the transition from the Abyssinian plateau to the flatter Sudan region much more gradual than in the neighbourhood of Wombera, which is the name given to the southern extremity of the range otherwise known as Borema. On the south side of the river, opposite Wombera, the land is low; the irregular hills and mountains constituting the slope from plateau to plain could be seen to the eastward at a distance varying from 15 to 25 miles. It will be noted, by reference to the map, that the Blue Nile makes a sharper *détour* southward than has hitherto been supposed to be the case; here its course was determined by compass triangulation of Danjiga and other peaks seen to rise directly from the cleft separating the northern from the southern slopes. The country lying between the line of march and the river is exceedingly rough, the great plateau being cut into a jumble of valleys and intervening mountains so irregular, so wild, so barren of all population and sustenance for human beings or mules, that no other westward course following the river more closely seemed to be offered at any point.

Two departures from the general line of march were made, leaving the caravan on the plateau, and descending partly on mule-back, partly on foot, to the river's edge, where aneroid-barometer readings were taken as to its elevation. The descents in both cases were exceedingly pifficult; the paths made by men were supplemented on the lower slopes by those due to the passages of lion-monkeys, and in the jungle at low levels close to the river, by broader paths made by the hippopotami, in their search for eatable grass. As compensation for these difficulties, many points of view presented scenes of wild magnificence, this being the work of the ages during which a current of water has cut its

seemed, of the whitish rocks above noted; and, further, these descents began farther from the river, and were made over succeeding mountains, while at the Muga crossing, the benches and intervening, nearly vertical surfaces seemed to have been cut out of masses more regular in their original arrangement.

At the Muga crossing a small fossil shell was found embedded in a soft stone, at elevation 6000 feet. Its character has not been determined.


TATEA TO BUMBADA.
Scale of Miles.
0 10 20
Route
Heights in feet.
11°
10° 30'
Zulim
COHEHUS COUNTRY
Swareet
SHAUKELE COUNTRY
AKAKO COUNTRY
Dura R.
BLUE NILE
Danjiga Mts
Abogodabo Mts
Serebanti
Tsaga R.
(flows into Bolessa)
Castle Rk
Alaltu R.
Borema Range
Gum Gum Mts
Wombera
WOLLO GALLA COUNTRY
BLUE NILE
Sassie Mts
Kesa Weho
Chuck Mt.
Sacked village
Dasifi
Fanoza
Kake
Bumbada
Mt Irba
Bolessa R.
Zhamburu Gorge Road
Cotton fields
Gomar

way down through 5000 feet of rock, the edges of the cut being at the same time worn down and borne away, until from level plateau at the north to level plateau at the south, a distance generally of about 6 miles, the whole slope on either side has been cut into a wild confusion, indescribable save by the camera.

The considerable streams which were found on the plateau are, in their order from east to west, the Zinjini, the Aiyah, the Durra, and the Tsaga. Of these the Durra has already been placed on the maps through information given by natives, and its assumed position has not been largely in error. The Aiyah and the Zinjini form one stream at a short distance from the Nile, while the Tsaga finds its way to the Bolassa. The watershed between the Bolassa and the Blue Nile lies only a few miles north of the latter stream, which, between the Durra and the Bolassa, receives by direct flow only small mountain streams. The northward extension of the Durra, Zinjini, and Aiyah, are shown in dotted lines on the map, since their courses could not, from the points of crossing, be followed by the eye for any considerable distance, and only native information was available as to their upper reaches. As these streams were crossed at the end of the dry season, there having been but one or two of the "little rains" to swell them, it may be taken that they are perennial in their flow. I judged them to be about as follows in respect to output:—

Durra, 35 feet wide, 1·5 foot deep, current = $3\frac{1}{2}$ miles per hour.
Zinjini, 40 feet wide, 1 foot deep, current = $2\frac{1}{2}$ miles per hour.
Aiyah, 35 feet wide, 1 foot deep, current = $2\frac{1}{2}$ miles per hour.
Tsaga, 20 feet wide, 0·75 foot deep, current = 2 miles per hour.

The soil of the plateau seems everywhere to be good. The region now considered resembles very closely the already familiar portions to the southward and eastward. In a few places the cultivation was fine enough to recall the fertile region around Harrar; irrigation ditches are not unfrequent; but for the most part the country was found to be industrially in a very poor position; great areas, which a few years ago were said to be covered with fat herds grazing, are now wholly without inhabitants. The cause of the disaster was the rinder-pest or some other bubonic plague, such as that against which the British Sudanese authorities are even now struggling, and which, it is feared, may have come down to them from Abyssinia. For many miles the path lay through great stretches of mimosa, though wherever a church was to be seen it was found densely surrounded by trees of larger growth, prominent among which could always be noted the fir tree. The great spreading tree shown in illustration was rather frequently met, but always isolated. It seems to be closely related to the great wild fig trees found in the region around Addis-Abeba, but many of those seen in this region seem to bear very little fruit as compared with the variety to the south and east. Occasional fields of cotton were

passed, in all cases very poorly cultivated and not growing luxuriantly —save one or two patches hidden in the bottom lands near the river by unsubjected Shankalis, who hide themselves in the valley jungles to escape Abyssinian taxation or servitude. Here they live as best they

DELRA MARKOS, CAPITAL OF GOJAM, FROM SOUTH-EAST.

can, depending, I was told, at the time of my visit, on hippopotamus meat. Exposed in the market at Gomar and Wombera I saw small stocks of the castor-oil bean and of a very black, dirty tobacco. The latter plant, however, I did not see growing anywhere on the route. At one point a few miserable villagers were found living on potatoes, which grew as best they could, neither in furrows nor in hills, but on flat surfaces under spreading trees.

Much of the grass covering great prairies seemed very dry, though, wherever favoured by a slight depression of land leading towards a fair stream, it seemed to be luxuriant enough to have supported goodly stocks of cattle. On the heights of Wombera the grass was very green and luxuriant, and in the small valleys dark olive and fig trees made as pretty a prospect, breaking the rich green of the prairies, as could be desired. The mimosa, when growing thickly and over wide areas, was always called by my interpreter a forest, but, its growth being stunted, I should have myself reserved that name to be applied only to the splendid groves of firs, cedars, and other trees to me unfamiliar, which densely cover the slopes of the plateau leading down to the lowlands west of Wombera. As far eastward as the region of the Durra, occasional date palms were seen on the plateau. In the valleys, such as that of the Durra and the Tsaga, these palms were numerous, and bananas were seen wherever a sharp fold in the valley gave them the necessary supply of water. Neither of these growths, which might be turned to much

account, seemed to add appreciably to the food-supply of the country, the natives being too ignorant or too indolent to properly use them.

Around one group of villages was found a cultivation of red pepper, said to be the source of a considerable part of the rather large amount of this condiment consumed by the Abyssinians.

As to animals, lions were much talked of, heard once, but not seen. The caravan passed near, on one day, to two leopards that were stalking some near-by deer. Of the latter a number of varieties were seen. I use the term generically, not being expert as to the distinctions which should be drawn. In several instances the herds grazed very near the villages, and seemed to have been but little disturbed save where Abyssinian soldiers, having firearms, were stationed. Wild cats, not much larger than a good-sized domestic animal, were frequently seen dodging from hole to hole in the ground. The hyæna, as usual, was audible, but rarely visible, while his small brother, the jackal, made bolder show. Lion-monkeys, grazier-monkeys, and a variety smaller than either of these were seen at Gomar and Wombera. Guinea-fowls were frequently seen, sometimes in droves of fifteen to twenty. Several varieties of wild duck were shot, from very small to large. They, however, are not numerous, the streams being for the most part very small. The vulturine was seen around a number of villages, apparently much at home. Sheep and goats were about as numerous as in the more familiar parts of Abyssinia. Mules and horses were scarce, although it was reported to me that in a section of country

MONKUSSA, A TYPICAL GOJAMMI VILLAGE.

lying just west of the line of march from Buri to Gomar, a considerable region was given largely to stock-raising. Cattle were very rare, so rare that the Galla were found drawing their wooden ploughs by hand, and it was said at Wombera that the few cattle noted under

the market tree had been driven from the south of the Nile. This scarcity of cattle has already been explained. It was said that the same disease had almost completely destroyed great herds of wild buffalo, which only a few years ago were reported to have been very numerous, especially around Wombera. Unfortunately, I saw none of these, but saw some tracks of a few beasts that still hide in the thickets, and come to the open only when seeking water. The Abyssinian soldiers seem to be rather keen about hunting these relics of an almost extinguished race. Elephants were often heralded, as they are throughout Abyssinia, as being always "a little far." My waning hopes in this respect vanished when, on descending the plateau, I was finally told that the herds which had been ranging in that region only a few weeks before had decamped across the Nile. Again I was forced to seek such satisfaction as could be had out of rare, dry tracks.

MUGGAR RIVER.

As elsewhere on the Abyssinian plateau, the temperature during the day might rise to 95° or 100° in the shade, while dropping at night as low as 38°—to the great distress of the traveller, who had not anticipated such a state of affairs.

The people seen in this region were, first, the dominant Amharic, Abyssinian, or Gojamite. These are, of course, the ruling class. Most of those living west of Gomar seemed to have migrated rather recently from the neighbourhood of Markos. The semitic type is strongly marked. I think it would be difficult to find in Europe, taking them at random, position for position, five more handsome and dignified men than these: Ras Worke, who governs this district under the king of Gojam, and indirectly under Menelik; the Dejasdmach, Hadanah Miriam, governor of Damot, a region around Gommer; Aga Faria Adisi, chief of the household of Ras Worke, at Buri; the officer commanding the

Abyssinian outpost at Wombera; and, finally, one of my guides, a retainer of Ras Worke, humble in station, but of Apollo-like form and feature.

Next may be mentioned the Galla, who seemed to be the bone and sinew of the country, as they are through so large a part of Southern Abyssinia. Those found in this section were engaged in agriculture, but seemed to have suffered much from the disasters above referred to in past years. In the region around Gomar were found the Aga, who impressed me as being a very poor lot. They are not slaves, but seemed to be politically wholly subject to the Abyssinians, and of a much lower level intellectually. Their dress is only a breech cloth, their arms the usual spear and shield. They are already well known.

Beginning at the Durra, and scattered at wide intervals along the route to Wombera, and further westward in the lowlands of the Blue Nile, were found the Shankali, very black, naked save for a string around the loins when living within sight of the Abyssinians, and throwing this aside as cumbersome when free in the jungle. The women wear economically dimensioned fringe dropping from the haunches to a length of about 12 inches, and, when they can be had, adorn their necks with a few bright-coloured beads. While these people are less familiar than the Abyssinians and Galla, they have already been sufficiently described in their country south of the Blue Nile, to need here only identification as being a part of that rather widely distributed people. It is of this material that the Abyssinians have made slaves, and one cannot wonder at it. Those who were seen in servitude to Abyssinian families in and around Markos looked quite as happy and better fed than those who maintained a precarious independence in the bush. While the escort of Aga men, furnished me for a time, seemed to stand in great dread of constant attack from the Shankalis, the latter always took the precaution, on seeing my caravan approach one of their villages, to promptly hide themselves, their women, children, and goats in the adjacent bush. This, however, need not be called cowardice, as their puny equipment of spears and bows and arrows could have been no match even for the modest array of fifteen rifles with which my caravan was armed.

Last, and perhaps most interesting, as being probably not heretofore known, was found a tribe called the Shinasha. They are not numerous, the whole number falling inside of six hundred, and live in a few villages between the Durra and Wombera. These villages are built over areas of rough rock, each hut seeking to lean against some vertical surface of stone, and hide the entrance to small cavities which they use for storing their provisions, the wretched hut itself being bedroom, kitchen, dining-room, drawing-room, and everything else combined. The dress of this tribe is more considerable than that of the Shankalis, but this is to be regretted as permitting higher reaches of dirtiness. Their faces I thought to be rather of the semitic type, although no suggestion of brotherhood with them would be admitted by

the Abyssinians. Intellectually they are evidently superior to the Shankalis, with whom they live in close contact, and whom they hold in a sort of religious subjection. Claiming great powers of necromancy, by menace of rain or drought, they force the Shankalis to yield up to them a part of their scanty store of grain, or meat, or honey. Each village seemed to recognize the considerable authority of a local chief, and I supposed this office to be hereditary, since in one case it was found to be filled by a very young man, probably not more than twenty years of age. They were very much frightened at the approach of the caravan, but were soon soothed, and enforced by the Abyssinian guide into some show of hospitality. A short vocabulary of their language and some Shankali words are given in a note, and these may yield, under the treatment of a linguist, some suggestions concerning the origin of this strange tribe. As my interpreter spoke only French,

THE BIRR RIVER, TRIBUTARY OF BLUE NILE.

Amharic, and Galla, the vocabulary was obtained through rather roundabout methods, and would undoubtedly shock a Shinasha purist.

A description of the region of the Bolassa valley extending as far as Famaka, where the first Sudanese post was found, may be given in a comparatively few words. The general level of the country slopes from the foot of the Wombera mountain rather rapidly to the point shown as Batambo on the map, the drop being from say 4000 feet to 3000 feet elevation.

Beyond this the drop is much more gradual, and the country begins to take on the familiar aspect which the Blue Nile shows through all its course in the Sudan. It is true that there are considerable hills, rising even to the dignity of mountains, close to Famaka. The Bolassa watershed does not extend westward to these hills, as the small streams begin to flow directly to the Blue Nile at a distance of about 5 miles westward of the Bolassa. There is, however, no important affluent

of the Blue Nile between the Bolassa and the Rahad. A number of large ravines are crossed, but they are almost all of them dry except in the rainy season. The Bolassa itself is a considerable stream, pouring into the Blue Nile over rocks, the current being so irregular as to render difficult any estimate of the output. However, making a rough guess, I should say that at the point where I crossed it, half a mile from its mouth, it was approximately 50 feet wide by an average of 1½ foot deep, with a current of 1 mile per hour. The plain was almost wholly covered with a thick scrub, chiefly of mimosa, through which passage was in many places very difficult. The country seemed to have been desolated by war; a number of village ruins showing destruction by fire were passed, and at one of these a guide who had been secured at the Bolassa said he had lost, a few years ago, his hut and two wives. He now, however, had a home and wives elsewhere, and the little mishap seemed to have left no trace upon his genial nature. The inhabitants were seen at only rare intervals, and, as noted above, all showed fright on the approach of strangers. One village (made up chiefly of Shankalis, but presided over by a very black chief, who called himself an Arab) was found perched as inconveniently as possible on the side of a mountain marked as Gum-Gum on the map. The poor creatures had chosen this point, to which they had to lift water from the Nile (here half a mile distant from the foot of the hill), that they might be safe from enemies. The paths that seemed once to have been worn by considerable caravan movements were still good where the soil was firm and pebbly, but had been completely overgrown in places where tolerably thick growth of vegetation was possible, and in consequence we were often forced to make such headway as we could in the portion of the bed of the Nile at that time dry, but in high water completely covered. The progress of the caravan was therefore exceedingly slow, and although the mules no longer had the cruel mountain-sides of Abyssinia to negotiate, they were considerably used up by numerous and exceedingly steep slidings-down and climbings-up in crossing dry gulches or in passing into or out of the high water-bed of the river.

The few inhabitants who were seen in this region were almost on the point of starvation; nor was it possible to find grazing-places for the animals. In the close neighbourhood of the Bolassa, however, we were able to get some bamboo sprouts, which had been found to be a very satisfactory food for the mules. Moreover, they were able to do fair work for two days practically without food. Until we found relief by the purchase of dourra from the stores of the Sudanese Government at Famaka, it had also been rather a close question as to supplying the men. We, however, got through without hunger on anybody's part; nor indeed need we have come at any time to grief, since there were many hippopotami in the stream, easily killed and recoverable within twenty-four hours after being shot; at about which

time, as I judged by experience, one may rely on seeing the black hulk stranded against some rock on the river-side.

Perhaps nothing could better indicate the desolation of the country than the fact that for seven or eight days no hyænas were heard around the camp, and, further, that the dead bodies of some black fellows, killed in a fight with the Abyssinian garrison at Wombera, were found, three days after the fight, only partially consumed, and that by vultures, not by hyænas, and only one vulture to the body, so far as I could note. Although I had been told that the country west of the Bolassa, and almost up to Famaka, was under the control of Ras Mangasha, and that he had a deputy living in the mountains about 20 miles west of Bolassa, who would demand my authority for being there, I found, as

BLUE NILE NEAR TARSO.

a matter of fact, no evidence of government of any kind beyond Wombera, until the Sudanese officer at Famaka, commanding that small station, now the easternmost representative of civilization on the Blue Nile, gave a surprised but hospitable welcome to a white man's caravan emerging from "no-man's-land."

As to vegetation, the domnut palm became frequent from the valley of the Bolassa westward, and furnished to the nearly starving inhabitants an almost impossible food from its hard outer husk. As the stores of grain even at Famaka and Roseires had been brought up from far below, and were considered available only for seed purposes, the natives, when purchasing small supplies of this grain, were commanded not to eat it, but to live yet a little longer on the domnuts and such occasional goat or sheep as might be sacrificed to their needs. The date palm was rarely seen; nowhere was it well cultivated. A very large spreading tree, bearing a fruit which consisted of an oblong shell

containing many seeds coated with dry sugary substance, was frequently seen, and the natives seemed to get some comfort, perhaps even a little nutriment, out of this seed.

The soil was in many places of a rich alluvial character, but also showed considerable areas covered with very brilliant pebbles. It would be exceedingly expensive to irrigate this land, but happily it seems that one good crop can be grown from the moisture supplied by the rainy season. The peace which followed the Kalifa's death last December has given rise to some small beginnings of cultivation at the very edge of Sudanese territory east of Famaka, but in that region, where only the empty claim of Abyssinian authority is made, it would seem that the existing desolation must continue.

A fair number of deer was seen seeking the Nile for water, coming from what must have been their grazing-grounds at some distance from the river. A very few also seemed to find subsistence in the jungles that sometimes closely bordered the river. Here also was seen a goodly number of Guinea-fowls.

As to the Blue Nile itself, it flows in a succession of almost dead pools and live rapids during all that length of its course which I saw. At the Muga crossing its width was 400 feet, its average depth 1½ foot, and by one not very reliable float measurement, its mid-stream velocity was 0·9 foot per second. The point visited near Gomar is also a well-known ford; as a caravan including rather small donkeys and small Shankali children had crossed it a few hours before I reached it, it may be taken that its depth here is inconsiderable. At the point near Gum, where I next reached it, I found, by wading, a depth of about 5 feet, shoaling rapidly, and a width of about 200 feet, but could not get soundings all the way across, as two Shankalis, with bows and arrows, the latter of which were said by the guides to be poisoned, stood on the southern shore, and, while carefully hiding themselves, seemed to object to any crossing being made. I believe it would have been possible to raft down the stream if one had indefinite time for lifting over the shallows and patching up the raft after what would necessarily be numerous shocks against the rocks of the shore. In the lower reaches, that is, below the plateau, the chief difficulties, aside from the continuing rapids, would have been met in the volcanic rocks which here for many miles line the bank, and at times are found in mid-stream. If, however, there had been another 12 or 18 inches of water, I should judge that some sort of down-stream navigation would have been possible all along the line. In the long southern elbow of the river, although I did not actually see it, I made careful inquiry as to whether any waterfalls existed, and all reports coincided to the effect that only the usual rapids were to be found. The bottom of the stream seems to be pretty well covered with boulders of varying sizes, from that of an apple up to that of a wheelbarrow.

The report of natives was to the effect that high water at the Muga crossing was about 40 feet above low-water level. This would bring it into tree-tops, and I imagine is a condition which has existed only on the rarest occasions. In order that the alignment of this great stream throughout the stretches which are so difficult of access may be known accurately, it may be found necessary to have a survey made by water. This could be done, I think, at mid-stage between low and high water in a strongly-built, small steamboat, which could be carefully pushed up from Roseires, to which point steam-navigation now reaches regularly during all but the very low water seasons. There would be some danger in respect to mid-stream rocks which might be covered at such a stage, but as the speed of the boat engaged in such work would

BLUE NILE AT CROSSING NEAR TARSO.

of course be slow, it would seem to me quite possible to push on in spite of an occasional thump.

It would seem to me that such an examination of the stream would be a matter of great importance, since the whole northern central region of Abyssinia might find a better connection with the sea in this way than as at present by caravan to Addis-Abeba, and thence to Zeila or Jibuti.

The astronomical determinations, latitude and longitude, were made by sextant; time being taken by the half chronometer made in France, called the "Montre torpilleur." This type of chronometer has been made for use on French torpedo boats, where it is said excessive vibration prevents the use of large chronometers. I think its service was good, as I had an opportunity of establishing with considerable accuracy its rate while coming down the Red sea, and again during a ten days' stay in Addis-Abeba, and finally, by the courtesy of Colonel Talbot,

with the proper standards at Khartum. Mercury was used for artificial horison until an originally small stock was exhausted; then resort was had to strained honey, oil, and, when the wind was entirely still, to water. On the daily march angles were taken by a compass every fifteen minutes, horizontal distances being measured by the known and ordinary pace of mule or guide. When the path was particularly tortuous, readings were taken at intervals of five or two and a half minutes. Mountains and other distant objects on either side were located only by compass readings taken as frequently as possible. Elevations were determined by an aneroid barometer. The readings of this instrument compared fairly well with elevations determined by other travellers from Zeila to Addis-Abeba. On arrival at Khartum, however, the reading was found to differ very considerably from the known elevations at that point. The subsequent loss of the barometer has prevented further checking of its accuracy. It is probable that a reduction of something like ten per cent. should be made from all the elevation figures given west of Addis-Abeba. They are recorded as made, since the doubt cannot satisfactorily be settled.

It may be of interest to prospective travellers in this region to know that it was possible to make this journey without very great inconvenience, having a caravan of only nineteen animals. Provisions were, for the most part, carried in wooden cases. I should have been glad to have had these with round corners, as the mules were severely punished in making the numerous ascents and descents. The gaping wounds made on their sides and backs still haunt me a little, but neither the mules themselves nor their native drivers seemed to be as much concerned as I. The caravan, as made up at Addis-Abeba, consisted chiefly of Galla, although these were thoroughly Abyssinianized. They were excellent mule-men, and better all-round men, except perhaps for the chase, than the Somalis. Of these I had four or five who had come up with me from the coast. They felt quite out of place on the highlands, and suffered more than the Abyssinians from the cold nights; differences of race and religion combined to make their fellowship with the Abyssinians somewhat lacking in sweetness and light. I should not now recommend this composite make-up, although it had been advised me by those far older and wiser than I, as preventing a complete conspiracy against the control which one ought to have over his men. There seems to be now sufficient material at a place like Addis-Abeba (especially if one be aided by the kindly guiding wisdom of Captain Harrington and Mr. Baird), in order that a competent lot of men may be gotten at that point. There was one other white man than myself with the caravan, namely, a young Englishman whom I engaged at Aden, and who accompanied me through to Cairo as a general assistant.

On reaching Roseires the men were sent back, and by happy chance, and through the kindness of Lieut. Parker, the solitary British officer in

command at this point, I was able to obtain a native boat, and in thirteen and a half days reached Khartum. This part of the journey was interesting to me, but as it was made through familiar country, nothing further need be said about it.

Mr. J. L. Baird, assistant diplomatic agent at Addis-Abeba, left that point about ten days after my departure, and reached Khartum three hours ahead of me. He went *viâ* Markos, Metemeh, and Abu Haraz. To him are due some of the interesting photographs appearing with this paper.

SHINASHA AND SHANKALI VOCABULARY.

English.	Shinasha.	Shankali.
Father	Tinchoa	Babia
Mother	Tunde	Eyo
Water	Aacho	Aiya
Fire	Tanwa	Mannja
Earth	Datcho	Enea
Air	Zhungo	Zuba
Man	Ikasbo	Mitaboga
Woman	Ikamaton	Mitanjofa
Women	Tsinamato	Michichimagafa
Men	Ashutsena	Michichimabega
Lance	Guino	Mooba
Head	Tako	Ilkoma
Foot	Toufo	Tchuguma
Hand	Kisho	Isma
Eye	Auo	Iltchuma
Mouth	Nono	Issama
Cow	Menja	
Horse	Farcha	
Mule	Bola	
Ass	Daja	
Tree	Mita	
Leg	Toofa	
Ear	Waja	
Stone	Swicha	
A child	Naa	
A girl	Maachina	
A boy	Mungusha	
House	Maa	
River	Hoka	
To eat	Mo	Nussana
To drink	Ous	Famia
To like	Neshunfer	Deshactsaam
To die	Kerre	Deshaqua
To run	Wacha	
To fight	Karra	
One	Ikka	
Two	Gila	
Three	Ke'ja	
Four	Aouda	
Five	Oucha	
Six	Shirta	
Seven	Shawata	
Eight	Shimata	
Nine	Zhedia	
Ten	Tacha	
Eleven	Tachaikka	

THE KAFUE RIVER AND ITS HEADWATERS.

By GEORGE GREY.

DURING the year 1899, the "Tanganyika Concessions Co." sent a prospecting expedition, under my command, into Northern Rhodesia. The sole object of this expedition was to search for valuable minerals, and with this end in view its course was directed to those regions which I believed to be as yet unprospected, and it traversed portions of some districts in North-Western Rhodesia which had been previously unexplored. Among other geographical discoveries was that of the source of the Kafue river and many of its northern tributaries.

The expedition was organized in Bulawayo during the months of February and March. The white members of the expedition were five in number: Mr. F. H. Crewe, second in command; Mr. J. N. Justice, geologist; Mr. Paul Macdonald, a prospector of many years' experience in South Africa; Mr. M. G. Farquhar, who accompanied the expedition for the sake of sport, and the interest of travelling through new country; I myself being the fifth.

Mr. Crewe was killed in March last, while fighting with Colonel Plumer at Ramathlabama. I cannot too much deplore the loss of one to whom to a great extent the success of this expedition was due. He was an accomplished native linguist, and thoroughly understood the native mind. By his unfailing tact and patience, he did much to enable the expedition to gain the confidence of the many native tribes through whom it passed, and to avoid in any single instance serious misunderstandings or hostilities.

The natives who left Bulawayo with the expedition numbered thirty-eight, and consisted of Zulus, Fingoes, and Matabeles. Twenty-five of them carried rifles. Transport was almost entirely done by animals, and for this purpose 67 donkeys, 6 oxen, 7 horses, and 2 mules were taken. The donkeys and oxen drew three waggons as far as the Native Commissioner's camp at the Lubu, which is about 25 miles south of the Zambezi river. From that point all the animals were packed or ridden. I consider that transport by donkeys is, where possible, preferable to the use of carriers, mainly because of the great difficulty of feeding a large number of carriers in sparsely inhabited districts.

The expedition left Bulawayo on April 5, and proceeded along the Lubu waggon road to Lubu, from there to Binga's kraal on the Zambezi river, lat. 17° 38′ S. Binga's kraal was reached on May 8, and the river crossed on that and the two succeeding days. From the Zambezi river the course lay nearly due north to the Kafue river, passing the British South Africa Police camp at Monze's, and following the Magoyi river to Minenga's kraal, in the eastern part of the Mashikolumwe country; then from Minenga's to Ntumiga's, on the Kafue. The Kafue was

crossed on May 30, in lat. 15° 39′ S. From the Kafue a north-easterly course was taken to the headwaters of the Chongwe river, and the course and valley of the Mwembezi river, a tributary of the Kafue, was explored. A temporary camp was formed near the source of the Chongwe, and a small party proceeded to follow that river to the point where it runs into the rough hills that form the edge of the plateau and the northern boundary of the Zambezi valley. From that point they went in an easterly direction to Unde-unde's kraal, and from there north, descending from the plateau to the valley of the Lunsefwa. The Lunsefwa, which is a tributary of the Loangwa, was touched near its junction with the Mulungushe, lat. 14° 54′ S., and from this point the party returned to the expedition's camp on the headwaters of the Chongwe. On July 19 the whole expedition again started northwards. They passed Chepepo's kraal, and crossed the Lukanga river near its source in lat. 13° 52′ S.; then crossed the Kafue, for the second time in lat. 13° 19′ S., between its junction with the Konfulafuta to the north and the Pongwe to the south; then a course rather west of north was taken; the Kafubu, a large tributary of the Kafue, was followed to its source, the headwaters of the Lufunsusa were crossed, and the Kafue again reached and crossed in lat. 12° 14′ S., at Lambula's kraal, some 40 miles from its source.

From Lambula's, the expedition, in order to avoid swamps, proceeded to and followed for a short distance the watershed between the tributaries of the Kafue and those of the Luapula. The Kafue was crossed for the last time on August 25 in lat. 11° 53′ S., and from this point I followed the river to its course, about 28 miles further north. The expedition then proceeded, with a course rather south of west, to cross all the northern tributaries of the Kafue, and a temporary camp was formed at Kwa-Nyunda, on the Mutanda, while this district was explored. The courses of the upper parts of the Mutanda, Kifubua, Lunga, Munyoshi, and Shilumba were all mapped.

On October 1 the expedition started south, and for about 100 miles kept at some distance from, but parallel to, the Lunga; then followed the Lunga to its junction with the Kafue, and the Kafue to the point where it bends sharply to the east near the Nkala mission station. The junction of the Kafue and Lunga was found to be in about lat. 14° 40′ S. The Matoka plateau was then crossed with a south-easterly course, and the main part of the expedition crossed the Zambezi at Binga's kraal on November 9. The majority of the expedition reached Bulawayo on November 24, the last waggon arriving on December 1. Thus, in less than eight months the whole expedition had travelled approximately 1750 miles, and at least another 1250 miles had been travelled by small parties making tours from temporary camps at which the expedition halted.

As much care as possible was given to survey of the route travelled

and of the country adjoining the route. Observations for latitude were taken every day when possible; the average direction of every march and its distance were carefully estimated.

To a South African, travelling north from Southern Rhodesia, the first great point of interest is the Zambezi river. The Zambezi river has been so often described that I shall only say here that I found it 480 yards wide at Binga's kraal where the expedition crossed it, and about 200 yards wide at Walker's drift, some 30 miles higher up, where I crossed on my return journey. From May 8 to 10, I found it still rising slightly; probably it was at about its highest for that season. No one could fail to be impressed by the magnificence of the mighty river, much less a Rhodesian, used to a country in which, during the greater portion of the year, running water is the exception.

The Zambezi valley is bounded on the north by very rough, steep mountains, which form the southern edge of the Matoka plateau. This plateau is now fairly well known; I found it to be between 3100 and 4250 feet above sea-level. Much of it appears to be an exceedingly fine, well-watered, stock-raising, and agricultural country. The soil is remarkably deep, and, judging by the splendid crops of Kafir corn and the thick luxuriant grass we passed through, must be very rich. The plateau has the appearance of a country healthy for man and beast. The Kafue river is the northern boundary of the Matoka plateau.

It may be of interest to give a general description of the Kafue river as known to me from actual observation in the dry season. In and immediately after the rainy season, which ends in March or April, all or most of the streams mentioned must carry much more water than they did at the time that I had the opportunity of observing them. Therefore my descriptions of fords, etc., must be taken as applying only to the winter or season of low water.

The Kafue is a river of many native names. From its source for a considerable distance it is known as the Lufubu. At and for some distance below its junction with the Lunga it is known as the Loenge. Below its western bend it is called the Kavuvu, Kafukwe, or Kavuvwe. I have never heard it called the Kafue by any natives, but am told that the natives who live on the Zambezi, near the junction of the rivers, speak of it as the "Kafue." Kafue is, however, the general name by which it is known to Europeans, and I therefore refer to it by that name. The Kafue rises in about lat. 11° 30′ S., at an elevation of 4400 feet above sea-level. Its source is similar to the source of all the streams I visited on the Congo-Kafue watershed. It heads in a dense clump of trees and bush which grow in a swamp. A rocky ridge about 200 feet high lies immediately to the north of this swamp, and is part of the watershed. The streams on the other side of this ridge run either into the Lufira or Luapula rivers, both of which eventually help to form the Congo.

All the country in the neighbourhood of the source of the Kafue is very swampy, and the river is fed by numerous small runners which drain extensive areas of swampy ground. As it is followed south-westward, it rapidly increases in size. Twenty-eight miles from its source a ford was found where the river was 10 yards wide, knee-deep, and carried a strong stream. To this point the Kafue had fallen 400 feet, and had run through narrow open flats bounded by low timbered ridges. The course is very winding, and is marked by a thin line of bush which grows on each bank and overhangs the water. Below this point the river enters and flows through a very extensive papyrus swamp, which is often some miles in width, and is probably 20 miles long. At Lambula's the river is again found to be enclosed between firm banks. Two large tributaries, the Shilumba and the Munyoshi, have entered it from the west, and I found the river at the crossing to be 20 yards wide, averaging about 2 feet in depth, very swift with a gravelly bottom. The general character of the stream, however, is sluggish and deep, and the bottom is muddy. Good fords are rare. The general course of the river from its source for 150 miles is south-east. It then bends to the south-west, and flows in this direction for about 200 miles, until it is joined by the Lunga in about lat. 14° 40′ S.

In this section I crossed it in lat. 13° 19′ S., and found a ford 70 yards wide, and not more than 3 feet deep; but, as higher up, the river is generally sluggish and winding, and I saw still reaches of water many miles in length. At its junction with the Lunga, the Kafue is between 150 and 200 yards wide. It has received many large tributaries—the Konfulafuta, Pongwe, and Lukanga from the east, the Kafubu, Lufunsusa, and probably many others from the west. In every place that I touched or followed it, between Lambula's kraal in lat. 12° 14′ to its junction with the Lunga, the Kafue runs between low well-defined banks, and flows in a winding course through a narrow open valley. Its course is marked, as higher up, by a fringe of trees and bush.

The Lunga is the Kafue's largest tributary, and is at its mouth about 100 yards wide. It heads, as does the Kafue, on the Congo watershed, the actual source of the Lunga being not more than 35 miles from that of the Kafue. The Lunga increases in size more rapidly than the Kafue, as it is followed from its source. It receives from the west the large tributary the Mutanda, about 60 miles from its source, and lower down the Muluma, Mfwashi, and Pungu. The Lunga in character resembles the Kafue; it has, however, greater fall. In 200 miles the Lunga falls 1300 feet, while the Kafue has only fallen 900 feet in a distance of 350 miles. In consequence of a steeper slope to the ground, the headwaters of the Lunga are less swampy than those of the Kafue. Below its junction with the Lunga, the Kafue develops into a most magnificent river. Its elevation is 3500 feet at the junction, and it

only falls 400 feet in the next 250 miles. It retains its winding character, following between firm low banks, and for 50 miles varies from 200 to 600 yards in width, is very deep, and has no perceptible current. Unfortunately, as it is followed down, it is found that extensive rocky ridges cross the river, splitting it up into swift narrow channels, and destroying all possibility of continuous navigation by large boats. Such granite bars I noticed both at Mbulembule's kraal and at Muyanga's.

From the Lunga, lat. 14° 40′ S., to Nkala mission station, lat. 15° 55′ S. (approx.), the general course of the river is slightly west of south. It receives in this distance very few tributaries, and those of no importance or size. Near the Nkala mission station, after receiving the small tributary, the Musa, the Kafue bends sharply to the east, and flows for about 150 miles through a wide level valley or plain, which has the appearance of being the bottom of an ancient lake, and is bounded on the east by a prominent ridge of mountains. The Kafue has cut through this ridge, and so drained the lake. The expedition crossed this valley on its northward journey, and I found the valley at the point of crossing to be from 20 to 30 miles wide, and about 3100 feet above sea-level. At highest water much of the valley is covered by the overflow from the river. This valley is quite treeless, and, until the grass is dry enough to burn in July or August, is covered with dense grass 6 feet high.

Such tributaries as run towards the Kafue from the north and south seem to lose any regular defined channels after they enter the valley, and either disappear entirely or lose themselves in extensive swamps. Owing to these swamps, the river is in this section, I imagine, often very difficult to approach. The expedition was fortunate in being supplied with good guides by the Shukolumwe chief Minenga, who brought it over solid ground to a place where there were firm banks on both sides of the river. The Kafue there (Ntumiga's kraal) is only about 100 yards wide, and has a current of 2 to 3 miles an hour. This is probably one of its narrowest points; in some places in this valley, I believe it attains to a much greater width. From a little hill on the northern edge of the valley, north-east of Ntumiga's, I overlooked the valley, and saw to the south-south-east the river 15 or 20 miles distant. The course of the river was marked by a long stretch of blue open water, and the river must at that point be very wide. We crossed this huge valley in winter, and found the cold very severe. The thermometer frequently fell below freezing-point at night. Owing to its treeless character, we suffered from want of fuel. Small quantities of wood could generally be bought from the native kraals, but when it was necessary to camp at any distance from a kraal, the entire absence of firewood and severe cold caused real suffering among the native members of the expedition.

The Kafue, when it leaves this valley or plain, passes through a prominent range of mountains, and in less than 100 miles joins the Zambezi river. The elevation of the plain is slightly over 3000 feet, the elevation of the Zambezi 1500 feet or less. There is, therefore, a fall

of at least 1500 feet between the plain and the Zambezi. Mr. Phillips, a railway engineer who visited the mouth of the Kafue last year, tells me that for about 40 miles above the junction the Kafue is very wide

and not rapid. Most of the fall, then, must take place in a distance of from 40 to 60 miles. Such a fall must make any kind of navigation absolutely impossible.

The area drained by the Kafue may be described as of oval shape, 350 miles north to south being its major axis, and 250 miles east to west its minor axis. The extreme north of this area supplies a much greater proportion of water than the southern and central portion; the rainfall in that portion north of lat. 13° must be much heavier than further south. The extreme southern portion of this area is the north half of what is known as the Matoka plateau. This plateau really extends north without a break to the Congo watershed, the slight descent to the lower Kafue from the south and the ascent on the northern side being so gradual as to be barely noticeable.

The expedition did not explore the Mashukolumwe country, which is reputed to be open, high, well watered, and hilly. The course chosen lay to the east of that country on the northern journey, and to the west of it on the return.

I found the country immediately north of the lower Kafue to be very similar to the Matoka plateau; the bush perhaps rather thicker, and the proportion of open country less. Much of it is well watered and fertile. A particularly fine open valley is that of the Luimba, a tributary to the Chongwe. North of lat. 15° the country was mostly covered with thick bush; it may be described as a rolling or level plain gradually ascending as it is followed north, generally covered with deep alluvial soil. Streams are numerous, though we found the country in the neighbourhood of Chepepo's to be badly watered. That portion between lat. 14° 40′ and 15° 40′ which lies to the west of the Kafue is, I believe, very dry and badly watered.

The Lukanga river intersects this plain. This river is remarkable for the immense papyrus swamp through which it runs. The swamp is often more than a mile wide. The expedition followed it for more than 20 miles, and nearly reached its source before a ford could be found over which the donkeys could walk. A man can cross in many places by walking on the dense reeds, which grow so close and thick that when bent down they will support his weight. In crossing over one of these places, I sounded with a long stick, and found that I was walking over the main channel of the river with 7 feet of water below me. The Lukanga is also remarkable for the immense flocks of geese and ducks which make their home in its swamps.

North of the Lukanga the country becomes gradually wetter and more swampy, and the bush and timber thicker and larger. From lat. 13° to the Congo watershed, I found the whole of the country which is drained by the Kafue and its tributaries to be of a very swampy character. We had great difficulty in traversing this country with our donkeys. Every little valley contained a swamp, into which the

animals sunk up to their bellies; every stream—and streams are very numerous—runs through deep alluvial soil, and its banks and bottom are mud of the softest character. The donkey is an excellent animal on hard or rocky ground, but does not show to advantage in mud. For several weeks travel was a most wearying business. Every march meant dragging the donkeys one by one through several swamps or streams, off-loading on one side and carrying the loads through to load up again on the other.

This extreme northern part of the Kafue basin is of much the same character as the country further south—that is, featureless forest. There are, however, a few prominent mountains, such as Chafuguma and Suka, which rise from 600 to 1000 feet above the surrounding country. Here and there are found patches of fine timber, but as a rule the trees are not large. Still, the further north the expedition travelled the thicker the bush was found to be, the taller and straighter the trees, and the more numerous were trees of a size which would make them suitable for the sawmill. Machabel, mahobohobe, and acacia, well known in South Africa, are found as far north as the headwaters of the Congo, and many other trees which I do not know further south. All kinds of thorn trees are conspicuous by their absence.

The monotony of this huge forest is relieved by numerous fine streams of water. As will be seen from my map, rivers at the extreme north of the basin are very numerous. All the tributaries shown are fine running streams of beautifully clear water. These rivers increase in size very rapidly as one follows them down from their sources. I saw the country in August, September, and October, the driest time of year, and was impressed by the great flow of water in the streams, and by the fact that there is evidence that the rivers never rise very much higher. The natives cross the streams on roughly made pole bridges, often only 3 or 4 feet above the water; over these bridges they told us that the water never rises. Nevertheless, it seems probable that the Congo-Kafue watershed has a very heavy annual rainfall, to keep up the enormous quantity of water which flows into the Kafue through these numerous tributaries.

The elevation of this northern portion may be said to be between 4000 and 5000 feet above sea-level. The lowest point that I visited on the watershed was 4400 feet, the highest 5000 feet.

All the mountains which bound the southern edge of the plateau north of the Zambezi appear to be composed of schists and quartzite. The plateau itself is generally found to be sandstone, generally horizontal. Some large areas are covered with crystalline limestone, notably east of the Mwembezi river and near the sources of the Shoa. Granite outcrop is scarce, and we never found it extensive. Iron is found to exist in large quantities nearly everywhere, and in the northern portion visited the mountains and hills, such as Chafuguma and Suka, are

composed of ferruginous sandstone; ferruginous conglomerate covers large portions of the country.

As the expedition stayed for such a short time in any one place, and as all its members, both white and black, were strangers to Central Africa, we did not attain to any great degree of intimacy with any natives, and only brought back a very general impression of their customs. Owing mainly to one Matabele, Mkoman by name, an old servant of Mr. Crewe, I never had any difficulty in freely communicating with any of the native tribes through whose country we passed. This Matabele boy started with a very good knowledge of the language talked by the natives on the Zambezi, and, being a born linguist, seemed naturally to pick up the different dialects of the northern tribes, which are all akin to the dialect spoken on the Zambezi. Mr. Crewe spoke a little of the Batonga language, and was able to talk to the northern natives, to a limited extent, without the help of an interpreter. Various native members of the expedition could talk the language of the Barotse and other similar dialects.

The Batongas of the Zambezi are, of all tribes we passed through, the most miserable and lowest type. They are lazy and unreliable; their habitations are the roughest form of grass huts; they appear to have barely any arts or industries, and are most cowardly. The Zambezi river has probably been their salvation, as, living on the banks of the river, they are always able to cross on to islands or to the opposite bank, and so have avoided extermination by raids of Matabele or other powerful tribes. The Zambezi native has a strong hereditary love for the river, which has for generations afforded him protection and supplied him with food in the shape of fish. But in spite of the long sojourn of himself and his ancestors on the river-bank, his canoes are the crudest productions that can be imagined. Any large tree is used, regardless of the irregularities of its shape, and is roughly hewn out; the result is a heavy hollow block of wood, often far from straight. Four hundred pounds is a good load for the best Zambezi canoe. No art is displayed by the Zambezi in making his paddle; it has no width of blade, and is generally little better than a stick; in fact, he will often work his tedious way across the river with any stout stick when a paddle is not at hand. Still, the Zambezi knows his river well, and we found the natives most willing to help us in the work of getting the animals and goods of the expedition across.

Mr. Gielgud, the native commissioner, came down from the Lubu and camped with the expedition while we were crossing the Zambezi. He kindly used his influence with the natives, and made all arrangements for our passage, getting nine native canoes to work, and lending us his boat. The price arranged was 5*s*. per day for each canoe. Our seventy-eight animals and 8000 lbs. weight of goods were all safely landed on the north bank by the evening of the second day after our

arrival on the river. The natives thoroughly understand this work, and the white man has only got to keep them at work, and no hitch occurs in crossing any number of animals.

When crossing oxen or donkeys, three men work a canoe; two are paddlers, one at each end, the third sits in the middle and holds the head of the animal close to or resting on the gunwale of the canoe. Once the animal loses its footing the work is easy enough, but it is often difficult to launch an obstreperous ox, who will resist being dragged and pushed into the water, and often makes a rush back for the bank, climbing over the canoe, filling the boat and knocking the boatmen into the water. The natives take all such accidents good naturedly, and those who get ducked join in the laugh raised by the others. Donkeys are far more passive; they are easily pushed into the water and towed across. They seldom make any effort to swim.

The Zambezi natives grow mealies, corn, ground-nuts, and sweet potatoes; they own considerable numbers of sheep and goats, but are most unwilling to sell any of their live stock. Along the low banks of the river mealies are planted and ripen at various seasons, drawing their moisture from the river, and being independent of rain.

The Batoka, who inhabit the plateau to the south of the Mashikolumwe, are very much akin to the Zambezis in nature and habits; like the Zambezis and the Mashikolumwe, both sexes knock out the four upper front teeth. On our journey north we found the Batoka natives very timid; kraals were entirely deserted on news of the approach of the expedition, the inhabitants flying into the bush and hills. This is, I think, due in a great measure to certain irresponsible white men who went up into this country in the winter of 1898, and, in pretence of trading, raided, robbed, and disgracefully treated the helpless Batoka. This raiding has now entirely ceased, owing to the establishment of two police stations on the plateau, and the promulgation of certain regulations by the B. S. A. Co., regarding traders in Northern Rhodesia.

The Mashikolumwe inhabit the valley of the Kafue river from its western bend until it leaves the plateau. They extend to some distance north and south of the river. The Mashikolumwe are as savage a tribe and as far removed from any from of civilization as can be found in Central Africa. Probably justly they have a reputation for treachery. Though the women wear as much, if not more, clothing than is customary in Central Africa, the men in nearly all cases go absolutely naked. Every man carries a bundle of long-handled barbed assegais. Nearly every man has dressed, or, to describe it more accurately, forced, his hair and scalp into the knob or spike which is peculiar to this tribe. Many wear the full head-dress, which looks like a long, straight, and flexible wand starting from the back of the head. One of these head-dresses I measured and found to be 45 inches long, measuring

from the skin of the head upwards. The head-dress is made of hair and grease, with a finely shaved piece of sable antelope's horn inside to stiffen it. In making it, the skin of the head is drawn back until a mass of flesh and skin protrudes 2 or 3 inches from the back of the head. This causes great pain at first; one whom we asked replied, "We bear the pain because of the beautiful result." On this artificially made base of soft flesh is built an upright cone, gradually tapering to less than 1 inch in diameter, and prolonged to at least 3 feet in height. The straight upright piece is quite flexible, and waves in the wind. The completed head-dress takes about three years to make, and the happy possessor of a 45-inch spike attached to his scalp takes great care of it. When he sleeps in a hut, the flexible end is tied by a string to the roof; when sleeping in the open, a long-handled assegai is stuck firmly in the ground at the man's feet, and the end of the head-dress is tied by a long string to the shaft of the assegai, so keeping it off the ground. In spite of the time and trouble taken to make these head-dresses, some of the men offered to cut them off and sell them for a few yards of calico. I had hoped to buy some on our return journey, but unfortunately passed south just west of the Mashikolumwe country, and saw no more of this peculiar head-dress. Though not tall, the Mashikolumwe are well made and active, and, judging by some who followed me when hunting on horseback, good runners.

We camped one night at a Mashikolumwe kraal between Minenga's and the Kafue river, and found that we were the first white people who had travelled on that path. Mbwire, the chief, had never seen a white man, and came to visit us wrapped in the skin of a lion, which had been killed in his cattle-kraal. I gave him a cup of very sweet tea, and was much amused at the way in which, after suspiciously tasting it, the old man clutched it tight and drank every drop, while his people looked enviously on. I found the natives at Ntumiga's kraal on the Kafue river to be very expert boatmen. Their canoes show much greater signs of skill in their manufacture than do those we saw on the Zambezi. They are very much thinner and lighter. It is, however, evidently very difficult for them to find trees large enough to make canoes of any size, and those can only be found at some distance from the river. Some canoes we saw were made out of two trees, one forming the bow, the other the stern, the two halves being neatly laced together with bark. Most of the canoes were more or less patched, and numerous leaks had to be constantly plugged with clay. The Mashikolumwe have much better paddles than the Zambezis; some were seen ornamented with carving. The natives, when paddling on the Kafue, stand upright in the canoes, and force them through the water at a considerable speed.

The Mashikolumwe own more cattle than any other tribe we visited. I saw several herds of cattle in the small part of their district

that the expedition passed through. The cattle are all of the very small type peculiar to this part of Africa. They are very unwilling to sell their cattle. We had no difficulty in obtaining at moderate prices an ample supply of grain from the Mashikolumwe in the neighbourhood of Minenga's, but on our return journey found the western Mashikolumwe had no food to sell, owing to the destruction of their crops by locusts.

The natives living to the east of the Mashikolumwe and the north of Kafue call themselves Basala, or Basola; they inhabit the country as far east as the eastern edge of the plateau. Important chiefs among them are—Shamaponda, who lives on the headwaters of the Mwembesi river, an old man who remembers the Swazi raid, and was taken prisoner by the Swazis when very young; and Ma-unde-unde, whose kraal is some 15 miles west of the Chongwe river.

In the valley of the Lunsefwa the natives are called the Baluana, Luana being the name of that district. The Baluana, who have had dealings with the Portuguese, I found particularly civil and well mannered. Their women wear the pelele, a metal disc inserted in a hole made in the upper lip, which is common to many tribes living east of the Loangwa river. The Luana district is famous for the fine tobacco grown there. We bought for calico a considerable quantity for the use of our Matabele.

Among these tribes I saw very few guns of any description; all the natives carry bows and poisoned arrows. The poison is in the form of a black waxy-looking material, and is put on the shaft of the arrow just above the point.

In the neighbourhood of the Lukanga a similar tribe, called the Balenje, live. North of the Balenje I quite failed to find any tribal name for the natives. The people of every kraal go by a different name; we found such names as Balamba, Baseba, Manyendwa, Bakaunda, and others. I came to the conclusion that, though these people are of one tribe or race, they know no name to denote their tribe, the names they gave us being family names.

Throughout the country drained by the headwaters of the Kafue and its tributaries, I found no big native chief. Small chiefs rule over small districts. Chepepo is a man of some importance, and further north Kapile Mpanga, Mlongo, and Mlegelwa appeared to have some influence. Several kraals are ruled by women, such as Luena and Lambula.

An Arab called Chiwallah lives on a tributary of the Konfulafuta, an eastern tributary of the Kafue, between lats. 13° and 14°. Chiwallah is much feared by the natives in the neighbourhood, and has established a reign of terror over a considerable area.

In the districts of Lambula, Mlongo, and Kapile Mpanga, the people build square huts with a round roof. They seldom wear skins, the

natural clothing being made of the bark of the machabel, which, when new, makes a neat and tidy blanket or loin-cloth, but soon gets ragged and torn. Those who have calico wear it in preference to the bark.

Though we were never without a sufficient supply of grain while staying among these northern natives, it did not appear that the natives possessed very large supplies of food. A common article of food is the root called cassava. Very little maize is grown, but a fair quantity of Kafir corn and sweet potatoes. From the number of fish-traps seen in all the smaller streams, I conclude that at certain seasons the natives live to a great extent on fish.

The method of cultivation in this part of Central Africa is as follows: The lands chosen are always in thick bush or timber. Over a large area the timber is chopped down, the stumps being left about 30 inches high. The smaller branches are then chopped off the trees, and are collected and piled thickly in strips of a few yards in width through the area cleared, care being taken to include all the larger ant-heaps, which are very fertile, within these strips. When thoroughly dry, these strips of branches and twigs are burnt, and the ashes serve to manure the soil beneath them. The fire also probably destroys the weeds and grass and makes the soil easier to cultivate. Thus a large quantity of forest is cut down every year to fertilize a proportion of its area. The stumps left sprout out again, and soon grow up into dense thickets of bush.

The custom of knocking out the four upper front teeth was not noticed north of the Mashikolumwe. The tribes in the northern part of the Kafue basin file each of the upper front teeth to a point. Individuals dress their hair in various eccentric ways, one of the commonest being to form it into round knobs, 2 or 3 inches in diameter; another to train it into cones or horns, one on each side of the head. Luena, a female chief, had grown a long plait of hair from her forehead, which was decorated with beads, and hung down over her nose to the level of her chin. Chiefs of kraals generally wear quantities of beads in their hair.

The custom of saluting a chief or important stranger is peculiar. The men kneel down, clap their hands, and then, bending forward, rub one shoulder and arm on the ground. Before a very important chief, they lie on their backs and wriggle on the ground. These antics remind one of the cringing submission of a timid dog, which they possibly imitate. The women, when saluting an important stranger, do so by lullilooing, a word coined by Livingstone to express a peculiar shrill scream, the sound being made to vibrate by hitting the mouth with the hand. At one kraal, passed in the Basola country, the women expressed submission by lying on their backs on the ground and clapping their thighs—not a very elegant proceeding.

We found that the members of the expedition were the first white

people who had ever travelled through a large portion of the country drained by the headwaters of the Lunga and the Kafue, and that the natives in these districts had never seen a white man before. The horses and donkeys created great interest, and when camping near kraals, numbers of natives used to occupy large ant-heaps or other commanding positions with the object of watching our animals. With a very few exceptions, these natives, after the first natural suspicion aroused by the approach of a comparatively large armed force had been allayed, appeared very pleased with our presence. It was pleasant, when visiting a kraal for the second time, to find a genial welcome.

Obtaining food is a much simpler business north of the Zambezi than among the Matabele or Mashonas. It is the custom, when a caravan camps near a kraal, for the chief to visit the leader of the caravan, bringing with him a present of food, generally large baskets containing meal, sweet potatoes, and ground-nuts, as well as some fowls and Kafir beer. When a rich kraal was visited, the chief's present was often more than sufficient to feed the whole party for one or two days. The size of the present depends, of course, to a great extent on the supply of food owned by the kraal. At Mlegelwa's, the chief's present amounted to 140 lbs. of meal, a large quantity of potatoes, some fowls, and Kafir beer. The chief refuses to visit the stranger without a present, to do so being apparently considered very bad manners. Considerable delay is sometimes caused by the preparing of the present.

Muyanga, who lives on an island in the Kafue, came to visit the expedition without the customary present. He was followed by a boy carrying a stool, which was put down opposite my tent. Without a word of warning, Muyanga told his stool-bearer to pick up the stools and, in spite of the expostulations of our interpreter, walked quickly away and crossed over to his island. I could only suppose that we had unwittingly offended him, and that he had gone away in a huff; a messenger was sent to ask the reason of his extraordinary behaviour. The answer was, that when Muyanga saw the white men, he realized what great chiefs they were, and was ashamed to have come to see them without a present, and would not return until he could come bringing an ox with him. That evening he came, bringing a young heifer and some meal.

Insect pests appear to be particularly numerous in the northern part of the Kafue basin. White ants are more plentiful and more active than I have seen anywhere else. Owing to the numerous swamps, flies of various kinds are abundant, and as early as September the large biting fly called the "hippo" fly was a great annoyance. Our stock suffered severely from the thousands of these flies which attacked them every evening. Many of the donkeys used to come in with their legs running with blood from the bites of these pests, and made raw sores on their hocks by biting at the flies. Midges are also particularly

virulent. North of lat. 13° I found the natives suffer considerably from the jigger, the small burrowing flea so well known on the West Coast of Africa and in Nyasaland. The natives called it maunda. When we first found the jigger, and saw many of the natives so lame that they could hardly walk in consequence of its attacks, I anticipated that we should have great difficulty with our Matabele, who, never having seen or heard of the jigger before, would, I thought, suffer worse owing to inexperience than the local native. Most of my boys had at one time or another jiggers in their feet, as had I myself and other members of the expedition. I was relieved to find that, if care was taken, the jigger extracted as soon as he was noticed, and the hole he had made treated with carbolic oil, the inconvenience caused by the insect is very slight. We had no cases among ourselves or our natives serious enough to prevent marching.

Patches of tsetse fly were found to be numerous in most of the country explored by the expedition north of lat. 14°, and also on the western bank of the Lunga and Kafue rivers as far south as the mission station at Nkala. There is also "fly" directly south of Nkala, between Nanzela and the Zambezi. I had hoped that, by making careful inquiries from the natives, the expedition might avoid "fly," but after crossing the Kafue for the second time, I found that native information on this subject was so unreliable, and that the "fly" belts were so large, that it was impossible to avoid the "fly." Therefore I pushed on in any direction that I wanted to explore, determining to get as much use as possible out of the stock before the "fly" killed them. The mortality of the expedition's stock was very much less than my previous experience of tsetse fly had led me to expect. This fact, and native reports and opinion on the present power of the "fly," have convinced me that the "fly" in this particular part of Africa is not such a fatal pest as it used to be before the rinderpest killed the buffalo. The natives repeatedly told us that since the rinderpest the fly no longer kills, and that they now take their dogs with them on hunting-trips with impunity. This story was repeated with variations. Muyanga was said to have made medicine and killed the "fly." Another story told us in that neighbourhood was that, since the "fly" had taken to biting women, it did not kill cattle. One way and another, we found a universal belief among the natives that the tsetse fly had lost its power.

The domestic animals which the expedition took across the Zambezi were 5 horses, 2 mules, 5 oxen, 67 donkeys, and 9 dogs. Of these three horses died, all probably, two certainly, from the results of fly-bite. Fourteen of the donkeys died from accident or other causes, but none, in my opinion, from the results of the tsetse fly. The mules, oxen, and dogs were unaffected by the "fly."

The explanation of the decrease of the fly disease in spite of the existence of the "fly" is possibly in the fact that the rinderpest was

in 1895 so severe in that part of Africa north of the Zambezi, that the buffalo, which existed before in great numbers, is now nearly extinct. Other kinds of game still exist in fair quantity, but the buffalo, which is generally found in connection with the tsetse fly, has disappeared. Surgeon-Major Bruce, by his investigations in Pondo Land, has proved that the tsetse fly is not the author of the disease which destroys domestic animals bitten by it, but only transmits the germ of a disease always existing in, but rarely, if ever, fatal to the wild animal. Possibly this disease is mainly confined to the buffalo, and does not exist to any great extent among the various species of antelope which are left. Hence the partial disappearance of the disease.

Most of North-Western Rhodesia is a good game country. Practically no shooting was done by the expedition, except for purposes of food, but there was seldom any difficulty in keeping up a good supply of meat. Eighteen varieties of antelope were killed, besides zebra, pigs, hippopotamus, buffalo (one only), and six lions. Elephants exist in the northern part of the Kafue basin. I nowhere saw evidence of large numbers. In one instance I saw the spoor of a herd of about a hundred to the west of the Lunga river, but, with this exception, the tracks I saw indicated troops of not more than ten. The natives near the Congo Free State are very well provided with muskets, and continually hunt the elephants. I saw in several places remains of freshly killed elephants. Unless regulations for their protection are strictly enforced —a matter of considerable difficulty—the elephant will in a few years disappear in this district, as it has elsewhere, only in this case it will be exterminated by the native without the help of the white man.

INTERNATIONAL OCEANIC RESEARCH.

The Conference at Stockholm in June, 1899, the report of which was summarized in the *Journal* for December, 1899 (vol. xiv. p. 646), was to have been followed by a second Conference in the autumn of 1900, but this did not actually come together until May of the present year. Representatives of eight nations—all of those bordering the North Sea and Baltic with the exception of France—met at Christiania, on the invitation of the Norwegian Government, on May 6, the meetings continuing daily until May 11. The Conference was officially announced as "for the exploration of the sea," but the proceedings were conducted on the understanding that the exploration in question was to be carried out strictly with a view to practical results, especially as regards fisheries. Sweden sent six delegates, including Profs. Pettersson and Cleve, Dr. Wijkander, and Mr. Ekman; Germany sent five, including Dr. Herwig and Prof. Krümmel; Great Britain sent four, Sir Colin Scott Moncrieff, Permanent Under-Secretary for Scotland, Prof. D'Arcy

Thompson of Dundee, Dr. H. R. Mill, and Mr. W. Garstang, of the Marine Biological Association at Plymouth; Denmark sent three delegates, including Captain Drechsel and Dr. Martin Knudsen; Belgium sent two; Norway two, Prof. Nansen and Dr. Hjort, to whom Profs. Mohn and G. O. Sars were added in a consultative capacity; and one delegate was sent from each of the remaining countries, Russia, Finland, and Holland, the last-named country being ably represented by Dr. P. P. C. Hoek.

The work consisted in the revision and completion of the Stockholm programme. The oceanographical section, having been very fully elaborated at Stockholm, was adopted with only a few trifling alterations and additions; but the biological programme was completely recast and brought into a form that commended itself to the Conference as thoroughly practical.

The most interesting feature, from the geographical point of view, is the suggested alteration of the proposed "spheres" of the different nationalities engaged on the joint work. Instead of the somewhat patchy areas allocated to the participating nations in the map published in 1899, it is now proposed that in the North Sea south of 58° N., the whole area west of 2° E. shall be allocated to Great Britain, while to the east Belgium, Holland, Germany, and Denmark will be responsible for the sea lying off their own shores.

From 58° to 62° N. the investigation of the North Sea and North Atlantic will be shared by Great Britain, Norway, and Denmark, while the North Atlantic farther north and the Arctic Sea will be investigated by Norway and Russia. The Skagerrak and Kattegat are assigned to Norway, Sweden, and Denmark; the western Baltic to Germany, Sweden, and Denmark; the southern part of the eastern Baltic to Germany; and the northern part, including the gulfs of Finland and Bothnia, to Sweden, Russia, and Finland. These divisions are intended to ensure that each nation will be responsible for certain definite areas, and that none shall be left out, but it is distinctly stated that "the suggested boundaries are not intended to hinder any nation from extending its researches beyond the special areas agreed upon."

The new programme for biological work is divided into three sections, dealing respectively with the Biology of Food-fishes, Plankton and Bottom Fauna, and Fishery Statistics. Under each head there are numerous paragraphs specifying the minimum requirements of the international scheme and the optional extensions which are desirable to be made if circumstances permit. In every case it is urged that the distribution of fish, fish-food, deposits, etc., should be ascertained with sufficient detail to permit of charts being drawn.

In order that the programme may be of service, there must be a proper organization for directing the work and funds, as well as ships for carrying it on. It is understood that the participating nations, by

the fact of their participation, agree to contribute the funds required for administration, and several of the countries—especially Norway, Russia, and Germany—have had special vessels built for carrying on their share of the researches. The other nations will, it is hoped, also arrange for an adequate equipment with which to carry on their share of the work, which, although scientific in plan, is purely practical in aim.

The Conference recommends that the participating nations should appoint an International Council consisting of two representatives of each country with full powers, that this Council should meet as soon as possible at Copenhagen and proceed to appoint the *personnel* of the Central Bureau, which shall carry out the arrangements for international co-operation, and of the International Laboratory. Both the Bureau and the Laboratory shall be permanently under the control of the International Council, but it is suggested that they should be independent of each other, and the proposals of the Conference are even compatible with the two being in different countries. A statement made in the Norwegian and German press that the Central Bureau will be situated in Copenhagen, with Dr. P. P. C. Hoek as secretary, and the International Laboratory at Christiania, with Dr. Nansen as director, is obviously premature, since the appointment of the staff can only be made by the International Council, which has not yet met. The official report of the recent Conference affords no confirmation of these rumours.

The work of the Central Bureau will be mainly administrative and editorial; a considerable part of its duties will consist in the elaboration of statistics. The International Laboratory, on the other hand, will be concerned with the supply of uniform, tested apparatus to all the participating vessels, research into methods of working, and the instruction of the assistants who will carry out the work on board the different ships, the analysis of samples of water collected on the expeditions, and the supply of apparatus to the participating states at cost price.

The Conference passed a resolution stating that it considered that the provision of a steamer specially constructed for scientific fishery researches by each of the countries concerned was absolutely indispensable. It also pointed out that it was very desirable that the Central Bureau should commence operations at latest by the beginning of 1902, and that the first of the quarterly simultaneous international cruises should take place not later than May, 1902.

The last of the resolutions runs as follows:—

"In distinct areas of the sea, as for example the Moray firth, in which any government has undertaken scientific experiments in the interest of the fisheries, and in which the success of the experiments is being hindered by the operations of trawlers, it is to be desired that measures be adopted for the removal of such hindrances."

This points to a difficulty arising from a curious anomaly in the political geography of the sea. Every nation has full power over all ships sailing or fishing under its flag, wherever they may be, and it can also enforce police regulations with regard to vessels of any nationality within the 3-mile limit from shore which bounds territorial waters, but not a yard beyond. For many years British trawlers have been excluded from the Moray firth in order to see whether by so doing the fish-supply, which had been rapidly declining, would revive; but as a great part of the forbidden area is more than 3 miles from land, it has become a happy hunting-ground for trawlers under foreign flags, and of course it is impossible to test the value of prohibiting trawling in such conditions. The guarded expression of sympathy with the difficulties arising from this state of matters will, we may hope, facilitate international arrangements for obviating the trouble which now frequently occurs, not only in the Moray firth, but in other waters where it may be British vessels are sometimes tempted in their turn to cross boundaries forbidden to the native fishing fleets.

KANT'S COSMOGONY—REVIEW.*

PROF. HASTIE has conferred a favour on those English students of astronomy and physiography who are not proficient in any language but their own, by his careful translation of the works of Kant relating to Cosmogony, and by his very able Introduction. He reminds us that Kant was a man of science first, a philosopher and metaphysician afterwards, and he puts in a remarkably clear light the contrast between the nebular hypotheses of the origin of the solar system and of the universe put forward by Kant and Laplace, hypotheses which writers of reputation—more familiar, probably, with the titles of the works of these originators than with the works themselves—have very frequently confounded or treated as identical.

From the nature of the treatises selected for translation, the work naturally lies in great measure outside the scope of geography, however widely that too elastic term may be stretched; but the arguments in the memoir on the retardation of the Earth's rotation are essentially geographical. The idea of tidal friction familiarized by the calculations of Lord Kelvin, Prof. Tait, and Prof. Darwin, and popularized in an almost startling form by Sir Robert Ball, is here shown to be no novelty of the later nineteenth century, but to have been presented with admirable clearness in the year 1754.

* 'Kant's Cosmogony as in his essay on the Retardation of the Rotation of the Earth, and his Natural History and Theory of the Heavens,' with Introduction, Appendices, and a Portrait of Thomas Wright, of Durham. Edited and translated by W. Hastie, D.D. Glasgow: James Maclehose & Sons. 1900.

Prof. Hastie refers at several points to the interest which Kant took in physical geography, but it was not part of his design to treat this fully. It is, however, a matter very well worthy of being treated, and we hope that an author who has proved himself so much in sympathy with the mind and methods of this great scientific organizer, and so competent to handle his views in the light of the most recent advances of science, will not ignore the "Physical Geography."

Kant's system of geography was elaborated with a logical completeness far in advance of the mere knowledge of facts in his day, and perhaps in ours. If it had not been lost sight of—drowned, we might almost say, in the flood of discovery which it ought to have controlled —it is possible that we would not now be confronted with the disgraceful antithesis of "geography and science," or troubled by the lurking suspicion that perhaps, after all, the geographer may deserve a lower place than say the physicist or biologist in the hierarchy of natural knowledge on account of some intrinsic demerit in his methods.

ADMIRALTY SURVEYS DURING THE YEAR 1900.

Under the orders of the Lords Commissioners of the Admiralty, seven of His Majesty's vessels, with three small hired steam-vessels, manned by 66 officers and 629 men, have been employed on hydrographical surveys on the home and foreign stations.

The following is a brief summary of the work accomplished, as detailed in the report prepared for presentation to Parliament:—

Reports of 272 rocks and shoals, which were dangerous to navigation, have been received at the Hydrographic Department, and were notified to the public by notices to mariners; 1167 miles of coast have been charted, and an area of 10,733 miles has been sounded.

On the south coast of England:—The bar of Portsmouth harbour was resounded; the general depths were found to be 29 feet, or 1½ to 2 feet greater than in 1897. The bar is mainly formed of shingle, and was deepened in 1894 to 29 feet.

There were found some very remarkable deep holes with as much as 35 feet in them, which bear eloquent testimony to the force of the scour of the tide, and to the movable character of the material forming the bottom.

The present depths show that the force of the stream is working mainly on the bottom.

Fowey harbour was resounded after the recent dredging operations.

The bay and bar of Salcombe river were resounded.

The survey of Dartmouth harbour was completed.

The examination of the dredging at the Cremill shoal by sweeping was completed, a depth of 30 feet being obtained. This, with the removal of the Vanguard and Bubble shoals, completes a great improvement of the entrance to the Hamoaze.

On the east coast of England:—The survey of the Orwell river from Pin Mill to Ipswich was completed. The Shingles Patch was resounded; it is still slowly growing in height and area.

The survey of the lower portion of the Humber river was completed.

The triangulation and coast-line between Scarborough and the terminal point of the survey of the Yorkshire coast off Whitby in 1898, was begun, but, on account of the prevalence of misty weather, was not completed.

A survey of the river Stour was begun.

The river Tyne was resounded between the eastern end of Jarrow lake and a point just beyond Messrs. Armstrong's works at Elswick.

On the west coast of England:—The survey of the approaches to Barrow-in-Furness was begun, but not completed.

On the west coast of Ireland:—The survey of Blacksod bay was completed.

The river Shannon was examined and a shoal not previously charted was found, but the changes since the original survey in 1841 are small. Bantry and Glengariff harbours were resounded.

A survey of Kinsale harbour was finished.

An examination of Kenmare river was made. The discovery of two small shoals reveals that a more exhaustive survey is required.

On the east coast of Ireland:—The report that the Maiden rocks off Larne harbour caused serious local magnetic disturbances was investigated, and no such effect was found.

On foreign and colonial shores:—In Newfoundland a thorough search disproved the existence of a rock shown on the charts to the westward of Belle Isle for 140 years. It has now been removed from the Admiralty charts.

The survey of Canada bay was completed.

A triangulation between Partridge point, St. Barbe islands, and Gull island lighthouse was made to enable this part of the coast to be adjusted to the recently-made survey of White bay.

In Notre Dame bay the whole area between Sunday Cove island, Tickle and Badger bay was surveyed; a plan was also made of Pilley island harbour.

On the west coast of Africa:—The survey of the west coast of Cape Peninsula from Cape Point to Lion's Head was completed.

On the east coast of Africa:—The outer anchorage at Durban, Natal, was resounded.

The Pungue river was surveyed. This survey was much needed, as the port has rapidly advanced, and is now of much importance in connection with the trade of Rhodesia.

Closely sounded plans were made of Zanzibar harbour. A chain of magnetic observations for variation made at sea off the coast showed that considerable alteration has taken place of late years, in the rate of change of this important magnetic element.

On the coast of Arabia:—The coast was surveyed from Perim to Ras Kaau.

On the west coast of North America:—Surveys were made of Discovery passage, Johnstone strait as far west as Jesse island, and large-scale plans of Seymour narrows, Gowlland harbour, Elk bay, and Otter cove.

The triangulation of the Straits of Georgia was also finished.

On the north coast of Australia:—Unsuccessful searches were made for the following reported dangers: Two areas in the Gulf of Carpentaria, Indus reef, Lyner reef, El Dorado rocks, and Squaw reef (so often looked for by other surveying vessels).

Money shoal, Marie shoal, two reefs situated south-east and south-south-east of Cartier island, together with Browse island and its vicinity, were examined and charted.

On the west coast of Australia:—The survey was completed from north-west cape to Ashburton roads. Monte Bello islands and Ritchie reef were surveyed.

Passage islands and Meda reef were surveyed.

On the south coast of Australia:—Recherche archipelago was surveyed from Cape Le Grand to Middle island and Pollock reef.

Plans were also made of Duke of Orleans and Goose or Middle Island bays. A line of deep-sea soundings was obtained from Albany to Tasmania.

On the east coast of Australia:—In Queensland the survey was resumed inside the barrier reefs, and completed from Princess Charlotte bay to Cape Melville, including the portion of the route from Dhu reef to King island and Bathurst bay.

A 3-fathom shoal, supposed to be identical with the "Wikengen" reef, was found in Princess Charlotte bay. Two unsuccessful searches were made for the reef reported by the s.s. *Karaweera*.

In China:—Two unsuccessful searches were made for rocks reported by s.s. *Esmeralda* and *Sokotra*. A survey was made of the Shaweishan or north channel into the Yangtse river, and a good channel was found, which has been used by the *Centurion* and other battle-ships. An area of 750 square miles of the banks north of the Yangtse Kiang was sounded.

The survey from Hong Kong to Canton river was commenced and completed from the Brothers to Yau-i-chau, including 70 miles of coast-line.

In India:—The survey between Honowar and Kundapur was completed. The survey of the coast between Madras and Cuddalore was completed. The survey of the coast between Kundapur and Mangalore was taken in hand, and is still in progress.

Magnetic observations and trawling operations have been carried out as occasion offered.

During 1900 the Hydrographic Department has published 102 charts and plans; 30 plates have been improved by the addition of 38 new plans; 224 plates have been largely improved by corrections and additions; 35,500 have received corrections at the hands of the draughtsmen.

The number of charts printed for the requirements of the Royal Navy, for Government Departments, and to meet the demand of the general public, has during 1900 amounted to 580,207.

THE MONTHLY RECORD.

EUROPE.

The Glens of Ayrshire.—A reprint has lately been issued from the *Annals of the Andersonian Naturalists' Society* (Glasgow, 1900) of a paper on the "Drift-filled and Post-glacial Glens of Ayrshire," in which the author, Mr. J. Smith, traces the changes which have taken place in the course of various river-channels during and since the glacial epoch. His attention was directed to the subject by noticing the frequent alternations in the course of the streams between banks of drift and perpendicular walls of rock, the latter forming deep narrow gorges. Further examination proved that these rocky gullies were clearly post-glacial, while to one or other side of them there was generally a drift-filled channel or glen. This is explained by the writer by the filling up, during a period of subsidence, of the pre-drift glen, so that on the re-emergence of the land the stream has commenced to cut a new channel laterally to its original course, thus forming a rocky glen outside the limits of the drift. The bottoms of the old glens appear in most cases to remain covered with drift, few Ayrshire streams running in the lowest part of these. Although there are a number of rock-bound hollows in the county,

the rocky gorges have not been cut through barriers to such hollows. The author specifies a large number of cases in which the above-mentioned changes have occurred; the new glen being in some cases entirely removed from the drift-filled channel, in others, as in the case of the Dunnach Burn, having drift-beds on one side and a glaciated rock-bank on the other. It is stated to be, apparently, a rule that the older the formations are, the fewer are the post-glacial glens cut in them, the reason assigned being that, the original valleys being deeper, the streams would be the easier guided back into them. The paper ends with an attempt to sketch the physiography of Ayrshire before the Glacial period.

Glaciation of the Southern Carpathians.—The *Comptes Rendus* contains a further note by M. de Martonne on the progress of his examination of the glacial phenomena of the Transylvanian mountains. During the summer of 1900 M. de Martonne explored the southern boundaries of the mountains, including the Cerna, Lotru, and Fogaras, and the *massif* of the Czukas. Two main conclusions are stated. First, the snow-line descends rapidly from east to west, from above 1900 metres in the Czukas to 1600 metres at the other extremity of Wallachia. This result, which agrees with that recently obtained by Penck and Cjivîc in the Balkans, seems to hold good for Europe generally, and its significance can scarcely be over-estimated. Second, in the *massifs* where the glaciers have attained the lowest levels (the Cerna) the moraine deposits are little disturbed, while in those where the glaciers terminated at higher levels they have suffered considerable erosion. The finest examples of *roches moutonnées* are observed in the regions where the search for morainic deposits is least successful, while they are rarely discovered under glacial *débris*, a point of interest as indicating the nature of the process of erosion in gradually obliterating traces of glacial action.

Seiches in the Sternberger See.—Herr H. Ebert contributes a paper on seiches to the *Sitzungsberichte* of the Munich Academy of Sciences. The author proposes to make an extended series of observations in the Bavarian lakes, and has begun with the Sternberger See, which is remarkable for simplicity of outline. A Sarasin limnometer was employed. The observations disclose the existence of a well-marked seiche of typical form, with simple vibrations, in accordance with Forel's theory, having a period of 25 minutes. This is a wave of the full length of the lake, having opposite phases at the two ends, and a nodal line crossing the lake at Tutzing. Another wave, having a period of 15¾ minutes, is superposed, forming a period between quint and sixth; but the period of both is independent of the amplitude. Sudden changes of barometric pressure are the most powerful meteorological agences causing these seiches.

Fishery and Marine Investigations in Norway.—The first volume of 'Reports on Norwegian Fishery and Marine Investigations' has been published by the Norwegian Home Office and the Trustees of the Fridtjof Nansen Fund, under the editorship of Prof. Hjort. It contains the results of investigations carried out during the years 1897–99, with the primary objects of ascertaining the influence of ocean currents on the Norwegian fisheries and the life-history and distribution of the fry of fishes at certain selected points on the coast; and it forms a complete account of the work done in Norway from the time when fishery investigations were first actively taken up by the Government, until they were organized on the larger scale upon which they are being now conducted, and the special steamer *Michael Sars* was built. Eight papers on methods and results of physical and biological research make up the volume. The authors and short titles are as follows: (1) "Fishing Experiments in Norwegian fjords," by Johan Hjort and Knut Dahl; (2) "Hydrographic-biological Investigations in the Skagerrak

and the Christiania fjord," by Johan Hjort and H. H. Gran; (3) "Account of the Post-embryonal Development of *Pandalus borealis*, etc.," by G. O. Sars; (4) "Decapods collected during the Investigations," by Alf Woellebaek; (5) "Hydrographic-biological Studies of the Northern Ocean and the Coast of Nordland," by H. H. Gran; (6) "On the Determination of the Salinity of Sea-water by its Powers of Refraction," by Hercules Tornøe; (7) "Synopsis of the Norwegian Marine Thalamophora," by Hans Kiaer; and (8) "Chemical and Micro-biological Investigations on the Curing of Herring," by Sigval Schmidt-Nielsen. The fishery investigations, which refer chiefly to the Skagerrak, the Christiania fjord, and the Trondhjem fjord, have already yielded valuable practical results. The disproportion observed between the abundance of the older stages of fish with pelagic eggs which spawn in the fjords and the scarcity of fry in the fjords is explained by supposing that the strong outflowing current during the spawning season removes the pelagic eggs from the fjords and the south coast of Norway, thereby preventing the bulk of them being hatched before reaching the waters of the coast. The sudden appearance of the fry in the fjords during autumn is regarded as an immigration. This result is one of far-reaching importance, and if it can be shown to be of general application, it must considerably modify the direction hitherto taken by fishery investigations, for it involves the overthrow of the doctrine that the edible fishes spend their whole lives in one locality, and form local tribes or races. If the fish producing pelagic spawn are to be regarded as belonging to one tribe common to a whole coast, it follows that the protection of fry at one spot will benefit all that coast, and the destruction of fry at one spot can be made good from another. The destruction of fry by the use of improper fishing apparatus must therefore be prohibited where it is most abundant and not, as hitherto, where it is most scarce. In the second paper the authors extend the result already published by them in co-operation with the Swedish hydrographers in the memoir "Skageraks tilstand," that the failure of the herring fishery in the Skagerak during the winter of 1896–97 was due to meteorological causes, and add a great deal of new matter about the Christiania fjord and its branches. Specially interesting is the discovery of quantities of sulphuretted hydrogen in the "dead water" at the bottom of the Frier and Drammen fjords, a condition only known to exist in the Black sea. The fifth paper, by Herr Gran, has perhaps the greatest general geographical interest. The first part of it, on the North Atlantic, deals chiefly with the relations between the northward-moving waters from lower latitudes (still unfortunately called "Gulf Stream") and the East Icelandic polar currents. The invaluable researches of Hjort on board the *Heimdal* during the winter of 1896–97, and the observations of the s.s. *Westye Egeberg* in 1898, are fully discussed and brought into relation with the work of Pettersson, Wandel, Knudsen, and others. It seems a pity that in connection with this subject, and particularly with reference to the regions west and north of the British Isles and the North sea, the author has not made use of the considerable amount of work done in this country during recent years. Prof. Tornøe describes a modification of Hallwach's differential prism, and gives the results of trial determinations of salinity. The instrument employed, however, is still in the experimental stage, and has not yet been actually used at sea.

ASIA.

Exploration of the Wady Mojib (Arnon River).—In an article published in the *Quarterly Statement* of the Palestine Exploration Fund, January, 1901, the Rev. Putnam Cady gives an interesting account of a boat-journey he made in February, 1898, along the east coast of the Dead Sea to the Wady Mojib, or river Arnon, which had apparently not been explored since Lieut. Lynch's expedition

in 1848. His observations have led him to correct several statements made by Lieut. Lynch. Soon after leaving the Jordan a strong current was noticed setting towards the north, which was observed all the way down the coast. Cliffs line the shore for the greater part of the distance, with but few landing-places. Before reaching the Callirrhoe, many streams of hot water were observed flowing down the mountains. Oil poured out from the rocks and covered considerable areas of the sea. The Arnon enters the sea through a chasm about 100 feet wide, which runs east for 450 feet and then turns sharply to the south. An immense delta extends out into the sea several hundred feet. The river, which has a very rocky channel, was with difficulty explored to a point where the chasm is only 4 feet wide, further progress being stopped on the brink of an apparently large waterfall. A curious phenomenon mentioned in connection with the Dead Sea was the sudden breaking of heavy waves on the shore, which, we are told, occurred on three successive nights at about 7.30 when no air was stirring, and lasted for an hour. In a note appended to the article, Major-General Sir Charles Wilson points out that this may perhaps have been something in the nature of the *seiches*, or disturbances of level, to which the Lake of Geneva is subject. The article is illustrated from photographs taken by the author.

Exploration of the Sea of Aral.—A thorough investigation of the Sea of Aral has been undertaken on behalf of the Turkestan branch of the Russian Geographical Society, by L. S. Berg, who has described the work carried out during the first season in the *Zemlevedenie* for 1900. A short account also appears in *Globus* for the present year (p. 213). The expedition set out from Kasalinsk on June 16 (? 1899) for the delta of the Syr Darya, where the topographer Molchanoff remained to execute a survey of the whole delta and the adjacent parts of the lake. On June 25 the expedition commenced the navigation of the lake, visiting the little-known islands of Barsa Kilmes and Nikolai, and afterwards landing on the west coast, where a geological examination of the Ust Urt plateau was carried out. After further explorations on the north-west shore of the lake, the leader returned to Kasalinsk, but shortly resumed work by an examination of the seiches on the lake. Extensive meteorological, hydrographical, and biological observations were also made, the depth in the centre being found to be 70 to 80 feet, while along the steep west coast depths reaching a maximum of 205 feet were obtained. The salinity was found to be very slight, but the water was extremely transparent, objects being visible to a maximum depth of 77 feet. Indications of a considerable rise in the level were noticed, whereas down to 1880 all travellers spoke of a rapid drying up of the lake. Marks were left to facilitate a future comparison of levels.

The Morphology of Transbaikalia.—The construction of the Siberian railway has involved a careful study of this region, and led to a more detailed knowledge of its physical features and structure, which alters a number of current conceptions. The great chain of the Yablonoi mountains, running from the south of Lake Baikal to the Sea of Okhotsk, can no longer be drawn on our maps in this way. Mr. Obrucheff, who superintended the explorations east of Lake Baikal, gave an outline of the results attained to the Seventh International Geographical Congress at Berlin (*Verhandlungen*, pp. 192–206). The valley-lines of the Chikoi-Ingoda-Chita separates a western from an eastern region. Western Transbaikalia rises to about 4000 to 4600 feet, with valleys which deepen from about 2800 to 3100 feet in the east to 1600 to 2800 feet in the west. They are rounded hills with wide water-partings and broad valleys more or less marshy. There are many forests of larches in the east and of pines in the west. Everywhere the scenery is like that of the Harz or Black Forest rather than that of the Alps. There are

five ranges almost parallel to each other, and striking from W.S.W. to E.N.E. The eastern ranges, commonly known as the Yablonoi in the narrower sense, Mr. Obrucheff calls the Malkhan mountains. They curve to the north-east in the east, and cease to form the divide between Arctic and Pacific flowing rivers. The Eastern Transbaikal or Nerchinsk plateau resembles the more deeply dissected western part of the western region, with crests about 4000 to 4250 feet and valleys from 1650 to 2800 feet. In the south-west the land, however, rises above the tree-line to 8200 feet in Sokhondo. Eight more or less parallel ranges can be traced, also striking from W.S.W. to E.N.E., abutting against the Great Khingan, whose spurs can be found west of the confluence of the Argun and Shilka. Precambrian metamorphic schists are wanting in the north-west of Transbaikalia, which must have been a continental mass since earliest times. Palæozoic rocks do not occur in the western three-quarters of the region, and marine mesozoic and tertiary deposits are absent altogether, so that the plateau has been land since palæozoic times. Although from the ordinary map one might infer that this is a typical folded mountain region, the feature-lines are due to fractures and the igneous outflows that accompanied them.

Journey in Borneo.—In a letter written from Long Bluöe (*Tijd. van het K. Nederl. Aardr. Genootschap*, No. 3, 1901), Dr. Nieuwenhuis describes a journey to the Sarawak frontier. He ascended the Makaham with a steamboat to the mouth of the Rata (steamers usually stop at Uju Tepu), and with the assistance of the Kayan chief, Kwing Irang, passed the falls and reached the source-region of the river. Here he ascended the Lasan Tuyan, 3600 feet high, the highest point of a ridge running northwards, over which a route descends to the Nyangeyan, a tributary of the Batang Rejang. Directly eastwards a range was seen culminating in a conical peak more than 6500 feet high. This was the Batu Tibang, the "central point of the earth" of the Bahaus. An examination of pebble-banks on the left-hand tributaries of the Mahakam proved its volcanic character. The water-parting range of the upper Kapuas extends into the basin of the upper Mahakam, on the whole in an easterly direction, and is interrupted by the volcanic highlands dominated by Batu Tibang. Here begins the basin of the Kayan river. The boundary with Sarawak is formed by the watershed between the Mahakam and Nyangeyan, consisting of a ridge 2300 to 5200 feet above sea-level.

The Poigar River, Celebes.—The Poigar river is, after the Dumoga, the largest river of Bolaäng Mongondo, a district near the eastern end of the great northern peninsula of Celebes. It rises in the Moöat lake not very far from the east coast, and flows north-westwards to the Celebes sea, which it enters at lat. 2° 10′ 6″ N. and long. 124° 10′ 2″ E. From a height of 3300 feet it falls over a series of steep slopes, with stretches of deep still water between, to the lake Iloloi. On either side are wooded mountains, and on the left bank, south of Iloloi, there are several hot springs. Both the river and the Iloloi lake, which is but an expansion of the river, abound in fish, especially eels as thick as a man's arm, and waterfowl are exceedingly plentiful. A few miles from the left bank of the Moöat lake rises the extinct volcano Ambang, and the country around is covered with volcanic ash. An island named Pasig stands on the lake. Hills surround it, except on the west side. The mouth of the Poigar river marks the boundary between Bolaäng, Mondongo, and Minahasa, and derives its name from the young leaves used to mark boundaries. The river was surveyed in 1899 under the direction of Mr. W. J. Pet. A map and views of the lake Moöat are published by Dr. Riedel in the *Tijd. van het K. Nederl. Aardr. Genootschap*, No. 2, 1901.

Timor and Roti.—The commission of 1899, appointed to delimit the Dutch

Portuguese boundary in Timor, came to the conclusion that the south coast of the island was very inaccurately represented on existing maps. Again in 1900 the *Siboga* sailed to the south coast in search of the Pearl bay of the English Admiralty charts, which, indeed, does not exist, and the survey then made confirmed the observations of the commission (cf. *Journal*, vol. xvi. p. 112). From the south-east and north-east the coast gradually trends inwards, so that the breadth of the island where the boundary crosses it is only about two-thirds as large as hitherto shown. The boundary-post on the coast beside the Talus river stands in lat. 9° 29′ 20″ and long. 125° 5′ 30″. Some few inaccuracies have also been discovered on the north coast. In Rotti, the chief point ascertained is that the Landu district on the north is a peninsula of Rotti, and not a separate island. Travellers have spoken of riding from the mainland into Landu, but their statements appear to have been overlooked (*Tijd. van het K. Nederl. Aardr. Genootschap*, No. 2, 1901).

AFRICA.

Navigability and Water-supply of the Nile.—A visit of inspection to the upper Nile has lately been made by Sir W. Garstin, who extended his journey southward as far as Gondokoro. The work of cutting through the *sudd* was continued last winter by Lieut. Denny at the southern end of the marshy tract, and there now remains a space of only 23 miles to be cleared of the obstruction. The portions of the channel opened last year by Major Peake have remained clear, and show no signs of renewed blocking. South of Gondokoro navigation is not yet possible, owing to the extremely low state of the river. The rains in the equatorial region have, however, set in unusually early, and a marked rise has already been reported from the Victoria Nyanza, so that an improved state of things may soon be expected. The opening of a continuous channel will not immediately prevent the loss of water to which the Nile is subject during its passage through the region of swamps. In order to effect this, the creation of firm and well-marked banks to retain the water within a definite channel will be necessary, and this has lately been engaging the attention of the Egyptian authorities. The restriction of the stream within a single channel will also have the advantage of increasing the rate of the current, so that in future blocking by means of sudd will be practically impossible. It is pointed out in the *Mouvement Géographique* that the re-opening of the Nile route will prove of great service to the north-east portion of the Congo State, for which it will soon prove the quickest route from and to Europe. Several Belgian officers have already made use of the Nile route, and it is pointed out that by this means the journey from Brussels to Rejaf can be performed in less time (eighteen to twenty days) than the voyage from Antwerp to Matadi.

A Fossil Sea-urchin from the Sahara.—M. de Lapparent has lately called attention, both in the *Comptes Rendus* of the Paris Academy of Sciences (vol. cxxxii. p. 388) and in *La Géographie* (April, 1901), to a fact which has been brought to light by him, and which has an important bearing on the geological history of the Sahara. The unlooked-for discovery has been made that a fossil brought home by Colonel Monteil from a spot in the very centre of the Sahara, in 18° 23′ N., not far from the Bilma oasis, represents a marine organism, probably of cretaceous age. M. de Lapparent's attention was directed to the subject by the statement of Rohlfs that fossils existed on the caravan route between Bilma and Agadem, and, mentioning the subject to Colonel Monteil, he learnt that a stone apparently bearing the imprint of an animal of radiate form had been picked up by him in the same district. On examination by M. V. Gauthier the specimen was pronounced to belong to a genus of Echinidæ lately established by an Indian Government geologist under the name Moetlingia, on the basis of a specimen from Baluchistan,

which is proved to belong to the upper cretaceous. M. de Lapparent points out how this discovery must modify existing views as to the geological history of the Sahara, by proving that in cretaceous times the portion in question was covered by the sea. A connection seems to have existed between this Saharan gulf through Lower Egypt, Palestine, Persia, and Baluchistan, with the Indian ocean, the biological conditions throughout this whole area favouring the existence of large sea-urchins and great quantities of ammonites. In our present entire ignorance of the geology of the region between Lake Chad, the Cameroons, and the Congo, M. de Lapparent shows that it is quite open to us to suppose that this Saharan gulf may have communicated with the seas which at that epoch washed the shores of the Gabun and Shoa. In any case, a rich harvest of results awaits the geological investigation of this region.

Expeditions in Abyssinia.—It is announced in the *Mouvement Géographique* that a Belgian expedition to the south of Abyssinia has been organized by the company which has been formed in Belgium for the exploitation of the southern provinces. Its leader is the Baron de Chedeuvre, who was a member of Count Leontieff's expedition to Lake Rudolf in 1899, and who sailed from Marseilles for Jibuti on June 3. A small steamer, to be named the *Menelik II.*, will be taken out in sections, to be launched on Lake Rudolf. A French scientific expedition has also lately proceeded to Abyssinia under M. Dubourg, and we learn from the *Politique Coloniale* that news of its arrival at Harrar has already been received. Early in May it was about to continue its route southward for the country of the Arussi Gallas.

Waterway on the East Coast of Madagascar.—The east coast of Madagascar is fringed, as is well known, for long distances by a series of lagoons and channels separated from the sea by narrow islands and banks of sand, now covered with vegetation. Although navigable for considerable distances, these channels are here and there interrupted by ridges of sand and clay known as "Pangalanes." The unsheltered nature of the outer line of the coast rendered it of special importance that this interior system of waterways should be improved and developed, and this has been accomplished since the French occupation by the opening of a continuous channel from Ivondro, a little south of Tamatave, to Andevoranto, the starting-point on the coast of the road and railway routes to the capital. An account of this undertaking, with illustrations and a sketch-map of the canal, is given in the *Tour du Monde* for June 15. Within the interval in question three separate ridges have had to be cut through, with a total length of nearly 3500 yards, involving the removal of some 800,000 cubic yards of material, not including that dredged from the intermediate sections of the canal. The depth of the latter varies from 5 to 6½ feet. The total length of the canal, which has been executed by private enterprise, is 80 miles. It is intended eventually to extend it to Tamatave, but in the mean time a short line of railway connects its northern extremity with that port.

German East Africa.—The Foreign Office Report on German East Africa for 1900 (Annual, No. 2568, 1901) contains several matters worthy of note. According to the census taken on January 1, 1900, the white population numbered 1078. Details are given regarding the agricultural and other products of the country. Tea is said to grow well, but up to the present has only been planted in small quantities; the export of coffee is increasing, and the cultivation of fibre is likely to be profitable. The extensive mangrove swamps which line the mouths of the Rufiji river produce a species of timber known as *boriti*, or Zanzibar rafters, much used in the building of native houses, and which is exported to Zanzibar,

Arabia, and India. Several important alterations in the steamship services are noted. The survey for the telegraph line from Dar-es-Salaam to Kilossa has been completed; it is hoped that this line will be continued to Ujiji. Progress has also been made with railway surveys during the year. The Usambara Railway was bought by the German Government from the German East Africa Company in March, 1899, and the sum of £115,450 was voted for the continuance of the line from Muhesa to Korogwe. The survey from Muhesa to Korogwe has been completed, and the 87 kilometres of line from Tanga to Korogwe will probably be opened for traffic on July 1, 1901. With regard to the proposed Central Railway from Dar-es-Salaam to Mrogoro, only the first 50 kilometres to Kola have been definitely surveyed. A trigonometrical survey of East and West Usambara has been made, and a map of the former (Handei) is about to be printed. Much topographical work has also been done in various parts of the colony, notably in Uhehe (Hauptmann von Prittwitz), in Usagara (Dr. Stuhlmann), and between the Tanganyika and Nyasa lakes (Dr. Kohlschütter). The frontier between the British East Africa Protectorate and German East Africa has now been finally settled. We learn that valuable work is at present being done by Dr. Busse, who is making a study of all the plants indigenous to the country. The rainfall registered throughout the colony during the year under review was in excess of 1899. Brief descriptions are given in the Report of the twenty-one districts into which German East Africa is divided. The gross value of the goods imported and exported during the first half of 1900 shows a decrease of £25,000 and £1000 respectively when compared with the returns for the same period of 1899.

Planting Experiments in German South-West Africa.—Attempts have recently been made with some success to improve the vicinity of Swakopmund, the port of German South-West Africa, by the introduction of exotic trees and plants. Hitherto the neighbourhood of the port has been a barren and dreary desert of sand, and any efforts in this direction require a large amount of care and perseverance, so that success is all the more gratifying. An account of these experiments is given in the *Deutsches Kolonialblatt* (No. 9, 1901), by Herr Ortloff, by whom they were carried out. It was necessary to choose such plants, as both require but scanty sustenance, and are able to stand considerable changes of temperature and to resist the tendency to strong transpiration caused by the excessive dryness. Another adverse condition to be guarded against is the strong sea-wind which blows at Swakopmund, and as a protection against this Herr Ortloff planted a screen of wild tobacco, which flourished well, though presenting an interesting instance of adaptation to altered conditions. The leaves, which at a distance from the sea are broad and comparatively thin, became, in their new habitat, both narrower and thicker, thus approaching the typical form of leaves exposed to desert conditions. Among the trees planted were oaks, pines, juniper, eucalyptus, date-palms, vines, and figs, young plants being obtained from various quarters. Little success was attained with these, but on procuring seeds and sowing them Herr Ortloff was more successful, especially with the date-palm and Port Jackson acacia (*A. Cyanophylla*). European grasses did not thrive, but good results were obtained by sowing the ray grass of the Cape. Large areas of sand were also planted with grass and other plants specially suited for such ground, while the results from the cultivation of vegetables were most promising.

The Production of Kola-nuts in West Africa.—An interesting account of the present position of the kola-nut trade in West Africa, and of the distribution and varieties of the kola tree, is given by Count Zech in the first number of the *Mitteilungen aus den Deutschen Schutzgebieten* for the present year. The species which is of most importance from a commercial point of view grows chiefly in

the interior behind the Gold Coast, and is called "Goro n Gonsha," or kola of Gonsha, from the district which contained the former mart of Salaga. It has been lately described botanically as *Kola vera*. Great quantities of the nut are exported from the district above mentioned to the Hausa countries, the amounts passing through Kratyi, in Togoland, alone, reaching a total of almost 250 tons during the first six months of 1899. The writer points out the importance for Togoland of the establishment of kola plantations, towards which a beginning has been made already in the neighbourhood of Tapa. The trees thrive best in forest districts and in the vicinity of watercourses. The trees at Tapa belong likewise to the species *Kola vera*, and it is said that the original plantations were formed by the accidental sprouting of nuts brought from Ashanti. Cultivation by the natives there is, properly speaking, none, though self-sown seedlings are often transplanted to positions where they may have room to grow. After gathering, the outer rind of the fruit is stripped off, but the nuts are kept fresh in transit by being packed in leaves, which are kept moist. The transport is effected either on men's heads or on the backs of donkeys, mules, or horses. The species of kola most prized is one which grows in Nupe, and is called "laboshi," from a place in that country; but its characters need investigation. A kind which it has been attempted to introduce into Togo from the Cameroons is said to be known to the Hausas as "dankwatoffu," but its quality is inferior, and other kinds found in Adamaua and Yorubaland are of still lower value.

The Climate of Morocco.—In the sixth number for 1900 of the *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, Prof. Theobald Fischer gives the promised completion of his work on Morocco, recently published as an Erganzungsheft of *Petermann's Mitteilungen*, in a paper on the climatology of that country. The names of the fifteen sections into which the paper is divided afford, perhaps, the best summary of its contents: observations, outline and relief of the region, pressure and winds, the coast region of cold up-welling water, thermal relations, rainfall, the extension of the coastal region, rainfall in the interior, the mountain region, temperature in the interior, dust-winds, temperatures of wells and springs, malaria, Tangier and Mogador as health resorts. The observations at disposal are unfortunately very deficient, both as regards the number of stations and the length of time over which the observations extend, but by a careful study of the existing material in relation to general conditions, Prof. Fischer is able to throw a good deal of new light on the climatology of Morocco. The mountain wall of the Atlas cuts the country almost entirely off from the Sahara region, and its climate is chiefly controlled by the sub-tropical high-pressure belt of the eastern Atlantic. During winter it is actually within the high-pressure belt, and during summer somewhat south of it; hence the winter winds are west and south-west, especially towards the north, while in summer the north-east trade reigns supreme. In the examination of the low temperature and high humidity of the coastal strip, due to up-welling of water off the coast caused by the winds, Prof. Fischer is able to make considerable use of ship observations, and his discussion of this part of the subject is of peculiar interest. The distribution of rainfall in Morocco is illustrated by a map, which shows a coast belt with an annual fall of 400 to 600 millimetres, giving an agricultural region of great fertility. A narrow belt of steppe land (200 to 400 millimetres) lies between this and the Atlas region, in which the rainfall exceeds 800 millimetres, yielding an abundant supply of water for irrigation of the inner margin of the steppe.

Dr. Fischer's Latest Journey in Morocco.—Letters from Prof. Fischer, who has lately undertaken a third scientific journey in Morocco, are printed in the fourth number of *Petermanns Mitteilungen* for the present year. From Mogador

Dr. Fischer had made an excursion into the interior and back to the coast-line of Safi, passing through the three southern provinces of Shedma, Ahmar, and Abda. Each of these has a distinctive character, which seems to account for the sharp division which has always existed between them. Thus Shedma is a bush-covered region in which goats are reared. Ahmar is a treeless steppe affording pasture to cattle and sheep; while Abda is mainly a perfectly level plain with black earth well suited for agriculture. Lake Zyma, the only lake of any size in Morocco, was carefully examined. It is a typical steppe-lake, becoming in summer little more than a sheet of salt. The important geological discovery of fossils, proving the cretaceous age of the great tableland of South Morocco, was made. Dr. Fischer penetrated a long distance to the east, everywhere making valuable additions to the cartography of the country. He suffered much inconvenience from rain and cold. On a subsequent journey he struck the Um-er-Rbia near the imposing ruins of Bulanau, first visited by Lamprière a century ago. The position of its castle is likened to that of Marienburg on the Moselle, but it is on a larger scale. Following the stream down, Dr. Fischer passed through a region whose inhabitants had never seen a Christian in their midst, but who proved most friendly. He executed a complete survey of the lowest part of the river, which has here cut out a winding cañon-like valley in the tableland, thus exposing the water-bearing strata, whence many springs take their rise. The proposed examination of the Jebel Zerhun near Fez was abandoned owing to disturbances in the country, and Prof. Fischer broke up his caravan at Casablanca, intending to proceed *viâ* Rabat and Tangiers to Marseilles.

AMERICA.

The Centre of Population in the United States.—The *Census Bulletin* (No. 62) issued in connection with the twelfth census of the United States discusses the question of the centre of population in the United States and its movement during each decade since 1790. The centre of population is defined as the centre of gravity of the population, each individual in it being assumed to have the same weight. Its position was ascertained thus. The population was first distributed by "square degrees," being assumed to be located at the centre of each square, except where some manifestly disturbing influence was present, in which case the position was estimated. A position was then assigned, tentatively, to the general centre, and the shortest distances to the parallel of latitude passing through it from each subordinate centre ascertained. By multiplying each of these distances with the total population of the corresponding squares the "moments" of population north and south of the assumed parallel were obtained, the difference giving the required correction in latitude, while an analogous process gave the correction in longitude of the assumed centre. In this way the centre of population in 1900 was found to lie in 39° 9′ 36″ N., 85° 48′ 54″ W., a point near Columbus, in Southern Indiana. In 1790 the centre lay only a little west of 76°, and since that date it has moved steadily west with greater or less rapidity, with comparatively slight shiftings north or south in the successive decades. Some of the southerly shiftings are accounted for by the addition to the United States of new territory in that direction, *e.g.* Louisiana, Florida, and Texas; but other movements, one way or the other, are due to increased settlement in various parts of the States. The extreme variation in latitude has been less than 19′, the centre having, during its westerly shifting through over 9½°, closely clung to the 39th parallel. The smallest movement of all was that between 1890 and 1900. A position is also assigned for 1880, 1890, and 1900 to the "median point" of the population, *i.e.* the point of intersection of the lines dividing the population equally north and

south and east and west without regard to distance from the centre. In each case the median point lies some 70 to 100 miles from the centre of population, in a north-east to north-north-east direction.

Eskers and Esker Lakes in North-Eastern Indiana.—The moraine-landscape of North-Eastern Indiana, due to the joint action of the Erie and Saginaw lobes of the ancient northern ice-sheet, is marked by a variety of unusual features, which give to the scenery a strange and artificial aspect. Among these are certain esker-like ridges which form the subject of a communication by Mr. C. R. Dryer to the *Journal of Geology* (1901, No. 2). Some of the most remarkable of these lie on a line between the townships of Noble and Washington, and form an irregular parallelogram nearly enclosing the basin of High lake, a piece of water about half a square mile in area. The system of ridges around this lake presents a variety of diverse but strongly marked features, the explanation of which is a matter of difficulty. South of the lake is an east-to-west gravel ridge, presenting the characters of a glacial esker, but unusual in its height (over 80 feet in parts), the steepness of its slope, its short extent and isolation. It is pierced from top to bottom by a remarkable kettle-hole. On the north is a ridge of till, an esker in form, but with the material of a sub-marginal moraine. In the west it bends southward and passes abruptly into a gravel ridge, which with other north-to-south ridges, partly composed of sand, is sufficiently esker-like. Supposing the till ridge to have been a frontal moraine, the writer suggests that the ice behind it was traversed by tunnels or cracks which surrounded a block occupying the High lake basin, and into which the surface *débris* was irregularly dumped. In this case the large kettle above alluded to must mark the position of an isolated ice-block or island, which must have persisted during the entire period of filling. Genetic classification of the system as a whole seems, the writer says, impossible.

The Water-supply of the Great Salt Lake.—Reference was recently made in the *Journal* to the threatened drying up of the Great Salt lake, and proposed measures to avert such an occurrence. In the *Monthly Weather Review* for February last the question of the connection between the level of the lake and the rainfall of the surrounding region is discussed by Mr. S. F. Mackie, who gives a sketch-map showing the drainage basin of the lake; the visible water-supply, all derived from streams descending from the Wasatch or Uintah mountains; and an area of wet soil lying to the west of the lake. The area from which the visible supply is drawn is but a small portion of the whole basin, and this supply is apparently not sufficient to balance the effect of evaporation. But it is possible that some water may be derived from the wet area above alluded to, which slopes up from the lake and approaches the small Sevier lake, also higher than Great Salt lake, which is the lowest point of a considerable drainage basin. The present average depth of Great Salt lake is 13 feet, and within a period of fifty years it has been as low as now, but it has (in 1869) also been 13 feet higher, which means that the area was then much larger, and the volume probably more than double the present. Some have ascribed the fall in the level to the amount of water diverted for irrigation purposes, but Mr. Mackie shows that this cannot be the dominant influence, as, in spite of constantly increasing irrigation, the volume of the lake doubled itself between 1850 and 1880. He shows, on the other hand, the close parallelism which can be traced between the level of the lake and the rainfall curve for the district since 1850, and though any conclusion based on this might possibly be erroneous, the obvious inference may be considered highly probable. The fluctuations in the level of the lake have an important influence on the surrounding country through the reduction of the height of the underground water and the saline contents of the soil caused by a fall in the lake. The effect of these

changes on the vegetation can, in fact, be plainly traced. In drawing the rainfall curve for the last fifty years, Mr. Mackie discards as inadequate the method by which such curve is based on the total precipitation for each successive year. He adopts a somewhat complicated method with a view to obtaining a *continuous* rainfall record. For this purpose he takes the progressive aggregate of the rainfall, deducting from it, for each unit of time employed, the corresponding mean precipitation, so that the curve fluctuates about a horizontal line representing the normal precipitation. In this way periods in which the fall is zero or less than the mean are represented by downward portions of the curve, which may, of course, be expected to coincide with a downward tendency in the lake-level. The comparison drawn by the author between this method and the one discarded, is hardly a fair one, the former being based on the *monthly*, and the latter on the *annual*, record of rain.

The Rocky Mountains and the Sierra Nevada.—Two important additions have recently been made to the geomorphological literature of North America in a paper by Dr. Emil Deckert (*Zeitschrift der Gesellschaft für Erdkunde*) on "The High Ranges of the Rocky Mountains and the Sierra Nevada," and another by Henry Ward Turner (*Proc. Californian Academy of Sciences*) on "The Pleistocene Geology of the South Central Sierra Nevada, with Especial Reference to the Origin of the Yosemite Valley." Dr. Deckert's paper describes the significant features of the highest regions by carefully selected types, chosen specially (as regards the Rocky mountains) from the Sawatch mountains, and points out the enormous difficulty of distinguishing the work done by glacial streams from that done by glacier ice in the general modelling of the surface. Special prominence is given to the generally uniform level of the mountain peaks, and the marked contrast of this to the case of the Alps is pointed out. This fundamental difference is largely to be ascribed to difference of geological structure, although the different action of the erosive forces also plays an important part. Mr. Turner's paper deals with (1) the pre-pleistocene orogenic history of the Sierra Nevada; (2) orogenic movements in the pleistocene; (3) pleistocene periods, divided into the Sierran, the glacial, and the recent or post-glacial periods; and (4) the origin of the Yosemite valley. In accounting for the Yosemite valley, the author agrees with Becker and Branner in ascribing it to river-erosion, facilitated by strong jointing.

AUSTRALASIA AND OCEANIC ISLANDS.

British Solomon Islands Protectorate.—Mr. C. M. Woodford's Report on the British Solomon Islands for 1899–1900 (Colonial Reports, Annual, No. 320) records a satisfactory increase in the trade of the Protectorate during the year. The export of pearl shell of the gold-edged quality has nearly doubled in consequence of the systematic use of diving-gear. A considerable quantity of the shell commercially known as "green snail," used for making buttons and for ornamental purposes, has been exported during the year. Of imports, tobacco continues to hold the foremost place. A marked increase in the area of land under cultivation is reported. With a view to the suppression of head-hunting raids made by the natives of the New Georgia group and adjacent islands upon the natives of Choiseul and Ysabel, a new Government station has been established at Gizo, at the western end of the Protectorate. The site is described as elevated and healthy, centrally situated for observation, and possesses one of the best harbours in the Protectorate.

GENERAL.

Livingstone College.—The new premises of Livingstone College were formally opened on May 23 by Mrs. Bruce, Dr. Livingstone's eldest daughter, a

statement as to the history and work of the college having been previously made by the principal, Dr. Harford-Battersby. The scope and aims of the college as a means of supplying a training in hygiene to missionaries about to proceed to the tropics have already been explained in the *Journal.* The beneficial results of such training have been fully proved in many instances, and, as a result of the increasing number of students availing themselves of the facilities offered, it has been necessary, since the founding of the college in 1894, to twice move to larger quarters. The present site is at Knotts Green, Leyton, where a fine old house and grounds, the residence of the late Mr. J. Gurney Barclay, were last year secured for the purpose. Contributions towards the expense of the purchase have been received to the amount of £4600, but it was stated that £3600 was still required, which, it is hoped, may be forthcoming before long, the college being regarded as a fitting memorial to Dr. Livingstone. The Royal Geographical Society was represented at the opening ceremony by Sir George Goldie.

Hawkins's Maiden Land: Errata.—The following corrections should be made in Commander Chambers' communication, printed in the April number of the *Journal:* On p. 421, line 30, *Serius* should be *Sirius ;* on p. 422, line 14, the name should be Anson; line 17, for *west* coast, *north* should be read ; and in lines 15 and 16 from the bottom, the bearings should be N. by E. and E. by N.

OBITUARY.

Dr. Emil Bretschneider.

Dr. Emil Bretschneider, one of the best-known authorities on Chinese geographical and antiquarian questions, died early in May at St. Petersburg, at the age of sixty-eight. The deceased scholar went out to China during the sixties as physician to the Russian Embassy at Peking, and resided there in all no less than eighteen years. He soon became known for his contributions, in *Petermanns Mitteilungen* and elsewhere, on geographical and historical questions, one of his earliest being a detailed description of the districts around Peking, then little known to Europeans generally. He was a good Chinese scholar, and in subsequent works, as, *e.g.*, in his 'Mediæval Researches from Eastern Asiatic Sources,' published in 1888 in Trübner's Oriental Series, he gave a valuable insight into the geographical knowledge possessed by the Chinese during the middle ages. Another of his works, entitled 'Fusang,' dealt with the supposed discovery of America by the Chinese, which he refused to accept as a historical fact; while in his 'History of European botanical discoveries in China,' published in 1898, he rescued from oblivion much of the early work by European travellers in this direction. His latest geographical contribution was a map and description of the Manchurian territory leased by China to Russia, published in the *Izvestia* of the Russian Geographical Society.

Lord Wantage.

We regret to record the death of the distinguished soldier, Lord Wantage, who died early in June, after a long illness, at his house, Lockinge Park, Wantage. Robert James Lindsay, Baron Wantage, was born in 1832, being the second son of Lieut.-General Lindsay, of Balcarres. He was educated at Eton, afterwards entering the army and serving with distinction in the Crimean War. For his gallant

conduct at Alma and Inkermann he gained the then newly instituted Victoria Cross. He was perhaps best known for his zealous support of the volunteer movement, to which, after leaving the army, he devoted himself with great energy, becoming first Lieut.-Colonel of the Berkshire volunteers, and subsequently commanding the Hon. Artillery Company of London. He also did excellent work in connection with the administration of charitable funds for the relief of sufferers by war. Lord Wantage was an extensive landowner, and gave much attention to farming, doing much to encourage the adoption of improved methods among his tenants and others. He joined the Society in 1867.

E. W. Parsoné.

Mr. E. W. Parsoné, whose death at the comparatively early age of fifty-two has lately been announced, was well known for his excellent work in connection with submarine telegraphy. Educated at University College School, Mr. Parsoné served for a time on the staff of the Great Western Railway, until his services were secured by the late Sir Charles Bright for the telegraph undertakings with which his name is associated. This, as it turned out, determined the rest of his career, which was devoted to work in connection with cable-laying in various parts of the world, especially the West Indies, South America, and West Africa. For the value of his services he had received decorations from both the French and Portuguese governments.

Obituary of the Year.

The following is a list of the Fellows who have died during the year 1900–1901 (April 30):—

J. S. Ancona; H. S. Ashbee; Dr. John Anderson; Arthur Austin; George Allan; Donald Andrew; Ralph Appleton; Wm. Brown; Sir W. Brooks; John Baird; Sir James Bain; John Butler; Joshua Peter Bell; G. T. Baron; James Buckle; Hon. John Baker; J. W. Bolton; Dr. J. C. Burnett; Dr. R. D. Buchanan; Major George Buckle; Edward Case; T. A. Cook; J. G. Cockin; Ernesto de Canto; J. F. Cornish; A. J. Currie; Hon. D. Carnegie; L. Cordeiro; Lieut. J. R. Craigen; Prof. Paul Chaix; Rev. James Chalmers; Sir W. Crossman; Thomas Devas; Lord Hamilton of Dalzell; J. H. De Ricci; Sir J. R. Dickson; Dr. G. M. Dawson; Captain P. R. Denny; Richard Eve; Viscount Encombe; Wm. Herbert Evans; C. Gordon Frazer; Sir M. Frazer; Dr. A. Fyfe; Sir R. Goldsworthy; A. J. Grant; Major J. Macpherson Grant; Peter Goiffon; H. M. Gordon; Abraham Gould; F. A. Gwynne; General M. Hunter; Commander G. Huntingford; Harry Harvey; Theodore Harris; Douglas Hall; L. H. L. Huddart; Lord Inverclyde; N. A. Jephson; G. Lawson Johnson; Joseph Johnson; George Kelly; James Kendal; E. H. King; L. W. King; Sir Edward Knox; J. H. Leech; J. P. Leslie; Louis Letord; Lord Loch; Edwin Ludlow; J. R. Lush; Wm. Maclean; Sir J. W. Maclure; Sir Thomas McIlwraith; P. H. McKerlie; Thos. Marwood; Rev. A. Marshall; Sir G. S. Measom; Sir R. Murdoch-Smith; Noblet Phillips; Major Serpa Pinto; General Pitt-Rivers; F. W. Preston; J. S. Price; E. A. Prinsep; R. Proctor-Sims; Fredk. Pullar; J. B. Redman; Rev. H. Richards; J. T. Rogers; Captain Ernest Rose; Alex. Ross; C. J. A. Rumbold; Robert Ryrie; The Duke of Saxe-Coburg-Gotha; General G. H. Saxton; Dr. H. Schlichter;

Captain D. G. Seagrim; Major-General E. C. Sim; Henry G. Simon; James Shoolbred; Edwd. Smith; S. Clement Southam; Hinton Spalding; Lieut.-Colonel Ross Thomson; Hon. F. C. Vereker; E. G. Verschoyle; S. Kingston Vickery; Admiral the Hon. W. J. Ward; Lieut. Watts-Johns; Sir G. H. Willis; R. B. Woodd; Matthew Woodifield.

CORRESPONDENCE.

The Egyptian Emerald Mines.

Hermon, 31, Lingfield Road, Wimbledon.

In the paper lately published (*Geographical Journal*, vol. xvi. p. 357) on the Egyptian emerald mines, the author, Mr. D. A. MacAlister, owing to lack of space, was obliged to confine himself strictly to what he himself had seen and noted, and therefore to omit mention of my own expedition to these mines in 1897–98, of M. Floyer's in 1891, and of Caillaud's two expeditions at the beginning of the century.

In both Floyer's and Caillaud's publications in French, the temples are illustrated and described.

For the same reason, Mr. MacAlister could give no account of the mines on the other or Zabara side of the mountains, which were visited by Mr. Forster, who was in command, and which I considered the most interesting and most promising.

The result of my expedition, which was made alone with a small caravan of natives, was the *raison d'être* of that in which Mr. MacAlister took part.

I think the old Roman wells might advantageously be opened up by the Egyptian Government, especially on the route from Edfu, which was the one taken by Caillaud on his second expedition. I found the Egyptians made splendid labourers and intrepid miners. I searched them in the middle of the desert on my way back, but found no gems, as Caillaud did, concealed upon the persons of his Albanians.

Yet the day after I quitted Aswan, as I was informed by some tourists, emeralds were offered for sale in the bazaar. A few of them were subsequently confiscated and forwarded to me by the civil governor, Ali Haidar.

H. W. Seton-Karr.

Drying up of the Great Salt Lake.

23, Alleyn Terrace, West Dulwich.

In the May number of the *Geographical Journal*, I see at p. 533 a note headed as above, in which, quoting from *Science*, the paragraph runs that Mr. Marcus E. Jones has proposed to prevent the possible extinction of the lake by bringing an additional water-supply into the Great Salt Lake basin by canal from the Snake river of Idaho.

Without entering into the question of whether the lake really is drying up, or is only on one of its downward marches, may I say that a suggestion to bring an added supply of water into the basin from the Snake river was made ten years ago by a Fellow of your Society, viz. the present writer, and will be found in the columns of the *Salt Lake Tribune* of the day.

I would add that the Great Salt Lake oasis and adjacent region presents—and I speak as a life-long wanderer and sojourner in many lands—some fascinating studies in the glories and mysteries of Nature, to which may be added, perhaps, the arts of man.

Frederick Trimmer.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1900–1901.

Anniversary Meeting, May 20, 1901.—Sir Clements Markham, K.C.B., F.R.S., President, in the Chair.

The Secretary read the minutes of the last Anniversary Meeting.

Elections.—*Captain R. L. Adberrcon (Cameron Highlanders); Samuel Aitken; Major Norman Cuthbertson (Black Watch); James A. Dengham; Somerville Helsham; Colonel Malcolm John Meade, C.I.E.; Elmer Bradner White, D.D.S.*

The presentation of the awards for the year then took place.

The President, addressing Dr. Donaldson Smith, said: The Council of the Royal Geographical Society had no hesitation in awarding you one of the Royal Medals, on account of your now memorable journeys on two occasions across unknown parts of Africa. Your first journey was undertaken, as every one knows, under very great difficulties indeed; then you found your way to the northern side of Lake Rudolf, and explored the lower course of the Omo, and returned by the east side of the lake and by a previously unknown route. That was a very important journey indeed. But, in my opinion, it is almost eclipsed by your second journey, although perhaps not more difficult, still far more striking and important, when you made your way from the coast to the upper Nile over an entirely unknown country. In my first address to this Society I mentioned three great blocks on the continent of Africa which were entirely unknown, and that which you have traversed and discovered is one of them, therefore, personally, I must offer you my very warmest congratulations. But the great utility of your journey is this: you have not, like an ordinary explorer, made a common route survey, but you have made a scientific survey, a triangulation frequently checked by astronomical observations with theodolite and chronometer, and it is that admirable work which you have done under considerable difficulties which has influenced the Council in deciding that you have well deserved the medal which is now awarded to you. Mr. Choate, his Excellency the American Ambassador, had promised to receive your medal, but the Council has been much gratified that you should have considered it yourself of such importance that you should have made a journey from the United States on purpose to receive it. I have much pleasure in placing the medal in your hands, and I may mention that this will be the last time the effigy of our late sovereign Queen Victoria will appear on the Patron's Medal.

Dr. Donaldson Smith, in acknowledging the honour, said: Sir Clements Markham and Fellows of the Royal Geographical Society, I wish to thank you exceedingly for this, and to express my appreciation of the very high honour the Geographical Society has conferred upon me. After labours and hardships, it is a great pleasure and satisfaction that such a very great authority as the Royal Geographical Society should confer this distinction upon me. As Sir Clements Markham has said, it will appeal to me very much, as I know it will to many people in the United States, to know that this will be the last time the face of Queen Victoria will appear on the medal. It is a special gratification to me that I have received this from the hands of so distinguished an explorer and geographer as Sir Clements Markham.

The President, addressing the Italian Ambassador, Signior Pansa, said: Your Excellency Signor Pansa, we have been informed by the Duke of the Abruzzi that you will be good enough to receive the medal for His Royal Highness. The Duke of the Abruzzi has undertaken two very important geographical explorations

at his own expense. His journey to the summit of Mount St. Elias was undertaken entirely, I believe, at his Royal Highness's own expense, and was of very great geographical importance. This enterprise of the Duke takes a very remarkable position. The attainment of our award, on the one hand for ascending Chimborazo by our gold medallist Whymper, and on the other hand the crossing of the glacier of Greenland by our gold medallist Nansen, stand as it were one on each side of this undertaking of the Duke, for in ascending mountains in a lower latitude there is only 4000 or 5000 feet of snow and ice to cross, whereas in ascending this famous mountain in a very high latitude the Duke had at least 14,000 feet to cross of snow and ice, which entailed upon him journeys and nights of weeks' duration upon the snow; and from that point of view I compare his work with that of Nansen in crossing Greenland: it stands between the two achievements. In my opinion that alone secured for the Duke a claim for one of our royal awards. But when we come to his arctic expedition, I think it will be allowed on all hands that those merits not only fill the cup, but overflow it. I had the honour of an interview with the Duke at Christiania, and I was then very much struck by his minute knowledge of all the details of the expedition. For close attention to details is the secret of polar success. In the *Stella Polare* he forced his way up that archipelago of Franz Josef Land, and attained a position which no ship had ever reached before. There he was in great peril and danger; his ship was driven on shore and was stove in, and he showed great powers of organization in bringing his men through the winter, repairing his ship and bringing it home again, and in organizing his sleigh expeditions to the north. I trust, Signor Pansa, that, in forwarding this token of respect of the Geographical Society for the work of His Royal Highness the Duke, you will convey to him the high appreciation of our Council for his labours.

Your Excellency, perhaps it will be convenient if I also request you to take charge of the award for Captain Cagni, who was the companion of His Royal Highness in his ascent of Mount St. Elias, and his very faithful and very excellent lieutenant during his arctic expedition. The great merit of Signor Cagni's remarkable journey was not so much the distance he went over as the fact that he had no depôt to rely upon, and nothing to be obtained from the country in the shape of food; he had to rely entirely upon his own provisions that he took with him. We therefore considered that Signor Cagni, having attained the highest latitude ever reached by man—86° 33′ N.—had won our commendation, and the Council therefore designated for him the Gill award. I have to request that you will transmit it in the form in which Signor Cagni has desired, which is, I believe, a silver tea-tray, and the diploma will go with it.

The Murchison Award has, as you are aware, been given to our old Map Curator and Instructor to the Society, Mr. Coles. I know that all his pupils, and I am sure that every one acquainted with him connected with this Society, will be delighted that he has had this award adjudged to him by the Council. I feel that we overworked him, and that he was obliged to retire on account of having been overworked by us, and I am very glad to be able to announce that since his retirement his health has improved.

Mr. Bernacchi and Sub-Lieut. Colbeck, the other two awards have been adjudged to you for your excellent work during your very severe service with Mr. Borchgrevink's expedition. Mr. Bernacchi made a series of very valuable meteorological and magnetic observations; but not only that, he has used his eyes to very good purpose, and has given us a great deal of valuable and interesting geographical information, including the paper he read to us last March, and it must have been a matter of gratification to him to have Sir Joseph Hooker and Mr. Blanford present,

who were both extremely interested in his paper, and who told me afterwards that it had set them thinking. Sub-Lieut. Colbeck has also done extremely valuable work, and has also been an excellent observer, not only in making astronomical and magnetic observations and in the drawing of charts, but also in using his eyes to very good effect, and being able to report many interesting points connected with the coast of Victoria Land. I have great pleasure in presenting the awards to Mr. Bernacchi in the form which he wished it to take, with the diploma, and to Sub-Lieut. Colbeck in the form he wished it to take, also with the diploma.

The President then delivered his Anniversary Address (see p. 1).

Visitors then withdrew, and, the President having appointed Mr. Wm. Corner and Mr. Fagan to be scrutineers, the election of the Council for the ensuing year was proceeded with. The honorary secretary, Major Darwin, read the report of the Council for 1900; this will be published in the Year-book for 1902.

The President then announced that the Council, as proposed, had been duly elected. The list is as follows, the names of new members, or those who change office, being printed in *italics* :—

President: Sir Clements Markham, K.C.B., F.R.S., F.S.A. *Vice-Presidents:* Right Hon. Sir George D. Taubman Goldie, K.C.M.G.; Colonel Sir Thomas Hungerford Holdich, R.E., K.C.I.E., C.B.; Admiral Sir Anthony H. Hoskins, G.C.B.; Admiral Sir F. Leopold McClintock, K.C.B., D.C.L., F.R.S.; *George S. Mackenzie*, C.B.; General Sir Charles W. Wilson, R.E., K.C.B., K.C.M.G. *Treasurer :* Edward L. Somers Cocks. *Trustees :* Right Hon. Lord Avebury, F.R.S.; Sir Cuthbert E. Peek, Bart., F.R.A.S., F.S.A. *Honorary Secretaries:* Major Leonard Darwin, R.E.; James F. Hughes. *Foreign Secretary :* Sir John Kirk, K.C.B., G.C.M.G., F.R.S. *Councillors:* Major-General Sir John C. Ardagh, K.C.I.E., C.B.; *Lord Belhaven and Stenton ; Prof. T. G. Bonney*, LL.D., F.R.S.; Sir H. E. G. Bulwer, G.C.M.G.; *Colonel J. Cecil Dalton*, R.A.; Clinton T. Dent; Major-General Sir Francis W. De Winton, R.A., G.C.M.G., C.B.; Admiral Sir R. Vesey Hamilton, G.C.B.; Colonel D. A. Johnston, R.E.; Colonel Augustus Le Messurier, R.E., C.I.E.; L. W. Longstaff; Admiral A. H. Markham; *General Sir Henry W. Norman*, G.C.B., G.C.M.G., C.I.E.; Sir George S. Robertson, K.C.S.I.; Howard Saunders, F.L.S.; General Sir Henry A. Smyth, K.C.M.G.; Herbert Warington Smyth; *H. Yates Thompson ; Admiral Sir Richard E. Tracey*, K.C.B.; *Colonel J. K. Trotter*, C.M.G., R.A.; Colonel Charles Moore Watson, R.E., C.M.G.

Twelfth Ordinary Meeting, June 10, 1901.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*R. B. Boyd-Carpenter; Bertram M. Chambers, Commander R.N.; Captain Thomas Ashley Cubitt, R.A.; A. G. Hipwell-Howitt; Captain D. C. Macdonald, Scottish Rifles; Henry Reeve, C.M.G.; Captain Edward Wilkinson, R.N.; W. Wybergh.*

The Paper read was :—

"Travels in Search of Waves in 1900." By Vaughan Cornish.

THE ANNUAL DINNER.

In the evening, the President, Sir Clements Markham, presided over the anniversary dinner, which took place at the Whitehall Rooms of the Hôtel Métropole. Among those present (250 in all) were the Duke of Northumberland, Lord Mansfield, the Lord Chief Justice of England, Lord Camperdown, General Sir Henry

Norman, Colonel Sir James Wilcocks, Admiral A. L. Douglas, Lord Belhaven and Stenton, Lord Eustace Cecil, Admiral Sir G. Noel, General Sir F. D. Lugard, Earl of Lathom, Admiral Markham, the Greek Minister, Dr. Moreno, Sir William Petersen, Dr. A. Donaldson Smith, Sir H. E. G. Bulwer, the Hon. G. C. Brodrick, Captain R. F. Scott, Sir William Abney, Mr. J. J. H. Teall, General Sir C. W. Wilson, General Sir H. Smyth, Sir Francis Mowatt, Sir George Robertson, Sir G. T. Goldie, Sir H. Howorth, Sir A. Hodgson, Prof. Ray Lankester, Mr. A. B. Kempe (Treasurer of the Royal Society), Major L. Darwin, and Mr. J. F. Hughes.

The PRESIDENT, after giving the loyal toasts, proposed "The Navy and Army," to which Admiral ARCHIBALD DOUGLAS and Colonel Sir JAMES WILLCOCKS responded.

The PRESIDENT next proposed the health of "the Medallists," which was acknowledged by Dr. A. DONALDSON SMITH.

The PRESIDENT proposed "The Royal Society," to which Mr. A. B. KEMPE, the Treasurer of the Royal Society, responded.

The PRESIDENT proposed "Success to the Antarctic Ship *Discovery*," which was responded to by Captain ROBERT SCOTT, R.N.

Sir GEORGE GOLDIE proposed "The Guests," to which the LORD CHIEF JUSTICE responded; and the toast of "The President and the Society" was subsequently proposed by the LORD CHIEF JUSTICE and acknowledged by the PRESIDENT.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is $10 \times 6\frac{1}{2}$.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alphabets. *Petermanns M.* 47 (1901): 56–57. **Henkel.**

Die Verbreitung der Schriftarten in Europa. Von Dr. L. Henkel. *With Map.*

On the distribution in Europe of the Latin, German, Cyrillic, Greek, and other alphabets.

Danube. *Petermanns M.* **47** (1901): 57–59. **Sieger.**
Zur Thalgeschichte des obersten Donaugebietes. Von Prof. Dr. R. Sieger.

Dardanelles, etc. ———
Sailing Directions for Dardanelles, Sea of Marmara, Bosporus, and Black Sea. Fifth edition, 1900. London: J. D. Potter, 1900. Size 9½ × 6, pp. xxvi. and 362. *Index Charts. Price 3s. 6d. Presented by the Hydrographer, Admiralty.*

Denmark. *B.S.G. Lille* **35** (1901): 290–303. **Oesterby.**
Le Danemark. Par M. Pierre Oesterby.

Denmark.
Den Danske Turistforenings Aarsskrift, 1901. København: G. E. C. Gad, 1901. Size 9½ × 6, pp. 158. *Illustrations. Presented by the Danish Tourist Club.*

A general account of the natural scenery and objects of interest to tourists in Denmark.

Denmark—Magnetism. **Paulsen.**
Institut météorologique de Danemark. Annales de l'observatoire magnétique de Copenhague. Publiées par Adam Paulsen. Années 1895–96. Copenhague: G. E. C. Gad, 1900. Size 13 × 8, pp. 50. *Presented by the Institute.*

Hungary. *Földrajzi Közlemények* **27** (1899): 261–266. **Hanusz.**
Magyarország határai. Hanusz Istvántól.

On the boundaries of Hungary.

Hungary. *Abrégé B.S. Hongroise G.* **27** (1899): 19–24. **Havass.**
Die Slovakisierung des Ungarischen Oberlandes. Von Dr. Rudolf Havass. [From *Földrajzi Közlemények* **27** (1899): 56–62.]

Gives the results of a study by Dr. von Korösi on the increase of the Slovak element at the expense of the Magyar in the Hungarian uplands.

Hungary. *Abrégé B.S. Hongroise G.* **27** (1899): 32–37. **Szántó.**
Die Geschichte der Stromregulierung im Oberen Csallóköz. Von Dr. Karl Szántó. [From *Földrajzi Közlemények* **27** (1899): 138–150.]

Csalloköz is the Hungarian name for the great Schütt island of the Germans, north of the Danube, where it first enters Hungary.

Hungary—Carpathians. **Martonne.**
Le levé topographique des Cirques de Gauri et Galcescu (Massif du Paringu). Par E. de Martonne. Bucuresci, 1900. Size 9½ × 6¼, pp. 42. *Maps. Presented by the Author.*

On the writer's detailed survey of two typical cirques in the Carpathians, with a view to elucidating their mode of formation.

Hungary—Carpathians. **Martonne.**
Recherches sur la période glaciaire dans les Karpates méridionales. Par E. de Martonne. (*Bulletin de la Société des Sciences de Bucarest—Roumanie,* An. ix. No. 4.) Bucarest, 1900. Size 11½ × 8, pp. 60. *Maps and Illustrations. Presented by the Author.*

Hungary—Historical. *Földrajzi Közlemények* **27** (1899): 169–174. **Téglás.**
A Rómaiak elsö hadi útja az Alduna jobb partján Dacia ellenében. Téglás Gábortól.

On the route along the right bank of the lower Danube followed by the Romans in their first Dacian campaign.

Hungary—Historical. *Földrajzi Közlemények* **27** (1899): 320–324. **Téglás.**
A Marosra és a Tiszára vonatkozó legrégibb földrajzi adatok. Téglás Gábor.

On the oldest geographical data respecting the Maros and the Tisza.

Hungary—Industries. *Földrajzi Közlemények* **27** (1899): 129–138. **Hanusz.**
Az iparüzés földrajzi elosztakozása Magyarországon. Hanusz Islvántól.

On the geographical distribution of industries in Hungary.

Hungary—Karas River. *Abrégé B.S. Hongroise G.* **27** (1899): 28–30. **Téglás.**
Die ältesten Namensvariationen des Flusses Karas. Von Gabriel Téglás. [From *Földrajzi Közlemények* **27** (1899): 78–80.]

The writer derives the Arcidava of the Peutinger Table from Arcas, probably a variant of the name Karas, and dava = "burg."

Hungary—Settlement. *Abrégé B.S. Hongroise G.* 27 (1899): 57–64. **Hanusz.**
Die Erstarkung unserer Nation im Alföld. Von Stefan Hanusz. [From *Földrajzi Közlemények* 27 (1899): 217–226.]

On the progress of settlement in the Hungarian lowland.

Hungary—Towns. *Abrégé B.S. Hongroise G.* 27 (1899): 24–28. **Bartek.**
Die ungarischen Städte als Centren der nationalen Bildung. Von Ludwig Bartek. [From *Földrajzi Közlemények* 27 (1899): 81–88.]

Iceland. *J. Manchester G.S.* 16 (1900): 149–177. **Newby.**
Iceland and the Icelanders. By John R. Newby. *With Illustrations.*

Continuation of a series of lectures delivered at the Manchester Geographical Society (cf. *Journal*, vol. xvii. p. 318).

Iceland and Faroe. *G. Tidskrift* 16 (1901): 30–34. **Hammer.**
Søopmaalinger under Island og Færøerne. Af Kaptajn R. Hammer.

Italy—Bibliography. **Magistris.**
Bibliografia Geografica della regione Italiana. Saggio per l'anno 1899 di L. F. de Magistris. Roma, 1901. Size 9½ × 6, pp. xii. and 150.

A useful compilation giving the titles and an indication of the contents of publications relating to Italy and neighbouring districts, whether books or articles in periodicals. It includes foreign as well as Italian works.

Italy—Brindisi. *B.S.G. Italiana* 2 (1901): 294–328. **De Giorgi.**
Il porto di Brindisi. Note di geografia fisica del dott. Cosimo De Giorgi.

The writer traces the natural causes which have led to the rise of Brindisi.

Italy—Geographical terms. *Riv. G. Italiana* 8 (1901): 89–101, 162–172. **Marinelli.**
Termini geografici dialettali raccolti in Cadore. Per Olinto Marinelli.

Italy—Place-names. *B.S.G. Italiana* 2 (1901): 280–294. **Grasso.**
Sulla frequenza e sulla distribuzione geografica dei Comuni attuali d'Italia con nome derivato dalla configurazione verticale del terreno (1ª serie). Nota del Prof. Gabriele Grasso.

Italy—Trade. **Neville-Rolfe.**
Trade of Southern Italy for the year 1900. Foreign Office, Annual No. 4550, 1901. Size 10 × 6½, pp. 22. *Price* 1½*d.*

It is thought that American coal may prove a serious competitor of British coal in South Italy. A great development of Italian trade (in German vessels) with East Africa is noted, but it is anticipated that Jamaica will prove a formidable rival as regards the fruit trade with the United Kingdom.

Italy—Venetia. *B.S.G. Italiana* 2 (1901): 328–336. **Stegagno.**
Alcuni cenni sui Laghi Euganei ed in particolare sul Lago d'Arquà-Petrarca. Nota preliminare del socio dott. Giuseppe Stegagno. *With Sketch-map.*

Gives the results of soundings, observations of temperature, etc.

Italy—Vesuvius. *Riv. G. Italiana* 8 (1901): 152–161. **Fiechter.**
Notizie sul nuovo rilevamento del Vesuvio eseguito nell' anno 1900 di Alfredo Fiechter. *With Illustrations.*

Mediterranean—Cyprus. *G.Z.* 7 (1901): 159–161. **Maas.**
Der Salzsee von Larnaca auf Cypern. Von Dr. Otto Maas.

An account of the investigations undertaken, at the instance of the writer, by Mr. C. V. Bellamy (cf. *Journal*, vol. xvii. p. 189).

North-sea coasts. *Verh. Ges. Erdk. Berlin* 28 (1901): 172–175. **Kretschmer.**
Herr Dr. K. Kretschmer: Die physische Entwickelung der Nordsee-Küste in historischer Zeit.

Abstract of a paper on the changes to which the North sea coasts have been subject.

Pyrenees. *J. Geology* 9 (1901): 28–46. **Adams.**
The Excursion to the Pyrenees in connection with the Eighth International Geological Congress. By F. D. Adams. *With Illustrations.*

The excursion was organized principally for the study, in the Pyrenees, of transformation of sedimentary rocks by intrusive mass.

Rhine. *G.Z.* 7 (1901): 140–148. **Huene.**
Eine orographische Studie am Knie des Rheines. Von F. v. Huene. *With Map.*

Rumania. **Martonne.**
La Roumanie. Géographie physique, Géologie, Climat, Biogéographie, Géographie économique, Géographie politique. Par E. de Martonne. (Extrait de la Grande Encyclopédie, T. xxvii.) Paris: Société Anonyme de la Grande Encyclopédie, 1900. Size $7\frac{1}{2} \times 4\frac{1}{2}$, pp. 72. *Presented by the Author.*

An excellent outline of the Physical Geography of Rumania, with sections on its Ethnology, Industries, Political Geography, etc.

Russia. *B. Comité Géolog. St. Pétersbourg* 19 (1900): 201–289. **Nikitin.**
La vallée de la Soura aux environs de la ville de Penza, ses modifications séculaires et récentes, par S. Nikitin. [In Russian, with *résumé* in French.] *With Maps.*

Russia—Kalendar. *Deutsche Rundschau G.* 23 (1900): 241–252. **Hegner-Rezelfeld.**
Die Reform des Kalenders in Russland. Von Dr. J. v. Hegner-Rezelfeld.

Russia—Kursk. *B. Comité Géolog. St. Pétersbourg* 19 (1900): 1–26. **Nikitin.**
S. Nikitin. Deux sondages profonds et les anomalies du magnétisme terrestre dans le gouv. de Koursk. [In Russian, with *résumé* in French.]

Russia—Novaya Zemlya. *Abrégé B.S. Hongroise G.* 27 (1899): 55–57. **Teleki.**
Histoire de la découverte de la Nouvelle-Zemble par le Comte Paul Teleki. [From *Földrajzi Közlemények* 27 (1899): 195–205.]

Russian Empire. *La G., B.S.G. Paris* 3 (1901): 133–138. **Barré.**
L'Atlas climatologique de l'Empire de Russie. Par L. Barré.

A description of the lately-issued Climatological Atlas of the Russian Empire.

Servia. **Macdonald.**
Trade of Servia for the years 1899 and 1900. Foreign Office, Annual No. 2553, 1901. Size $10 \times 6\frac{1}{2}$, pp. 20. *Price* $1\frac{1}{2}$*d.*

Contains details of recent attempts at gold-mining, regarding which the writer says, "A sober hope that gold may be worked in Servia in paying quantities is all that experience would seem so far to justify."

Spain—Ancient geography. **Blázquez.**
B.S.G. Madrid 42 (1900) (Separate Memoir, 72 pp.).
Descripcion de Iberia, por Estrabón, traducida por Antonio Blázquez.

United Kingdom—Cornwall. *P.S. Antiquaries* 18 (1900): 117–123. **Haverfield.**
On an inscribed Roman ingot of Cornish tin and Roman tin-mining in Cornwall. By F. Haverfield. *With Plate.*

United Kingdom—Ireland. **Ward.**
Thorough Guide Series. Ireland (Part II.) East, West, and South, including Dublin and Howth. By C. S. Ward, M.A. Fourth Edition. London: Dulau & Co., 1901. Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. xxiv. and 236. *Maps and Plans. Price* 5*s. net. Presented by the Publishers.*

A few additions have been made since the third edition, published in 1895.

United Kingdom—Rainfall. *Quarterly J.R. Meteorolog. S.* 27 (1901): 79–97. **Mellish.**
The seasonal rainfall of the British Isles. By Henry Mellish. *With Map and Diagrams.*

The writer gives both the monthly and seasonal percentages of total rainfall for some two hundred stations in the British Isles.

United Kingdom—Scotland. **Baddeley.**
Thorough Guide Series. The Northern Highlands (Scotland, Part ii.) containing a full description of Aberdeen, Inverness, Loch Maree, and Gairloch, and of the mainland north of those places in the Counties of Aberdeen, Banff, Elgin and Nairn, Inverness, Ross and Cromarty, Sutherland and Caithness. By M. J. B. Baddeley, B.A. Sixth edition. London: Dulau & Co., 1901. Size $6\frac{1}{2} \times 5$, pp. xvi. and 150. *Maps and Plans. Price* 3*s.* 6*d. net. Presented by the Publishers.*

The additions to this well-known guide, as compared with the fifth edition (1894), are chiefly in points of detail.

United Kingdom—Scotland. **Murray and Pullar.**
A Bathymetrical Survey of the Fresh-water Lochs of Scotland. By Sir John Murray, K.C.B., etc., and the late Fred. P. Pullar.—Obituary—Frederick Pattison

Pullar. By James Chumley. (From the *Geographical Journal* for March, 1901.) Size 10 × 6½, pp. 26. *Maps and Illustrations.*

United Kingdom—Scotland. **Murray and Pullar.**
Scottish G. Mag. **17** (1901): 113–128, 169–175.

A Bathymetrical Survey of the Fresh-water Lochs of Scotland. Parts ii. and iii. By Sir John Murray, K.C.B., etc., and the late F. P. Pullar. *With Maps and Illustrations.*

This paper is identical with that published in the *Journal* for March last.

United Kingdom—Scotland—Spey. *Scottish G. Mag.* **17** (1901): 185–193. **Hinxman.**

The River Spey. By Lionel W. Hinxman, B.A. *With Maps.*

On points of interest presented by the physiography and geological history of the Spey.

United Kingdom—Thirlmere. *J. Manchester G.S.* **16** (1900): 225–226. **Oldham.**

Beach Formation in the Thirlmere Reservoir. By R. D. Oldham. *Illus.*

Abstract of a paper read at the Bradford meeting of the British Association, in which Mr. Oldham describes the beach-formation which has taken place in Thirlmere since its conversion into the Manchester reservoir.

ASIA.

Central Asia. **Futterer.**

Die Allgemeinen Wissenschaftlichen Ergebnisse einer Forschungsreise durch Central-Asien. Nordost- Tibet und Inner-China. Vortrag gehalten auf dem VII. Internationalen Geographen-Kongress in Berlin im Jahr 1899. Von Prof. Dr. K. Futterer. (Sonderabdruck aus den Verhandlungen des VII. Internationalen Geographen-Kongresses in Berlin, 1899.) Berlin, 1900. Size 10 × 6½, pp. 781–807.

Central Asia. *Verh. Ges. Erdk. Berlin* **28** (1901): 77–86. **Hedin.**

Reiseberichte von Dr. Sven Hedin aus Central-Asien. (Aus Briefen an Herrn v. Richthofen.)

In these letters Dr. Hedin gives some additional details respecting his recent journeys, described in the February number of the *Journal* (vol. xvii. p. 181).

Central Asia. *Deutsch. Rundschau G.* **23** (1901): 311–316. **Kozlov.**

Die Reise Kozlov's in Central-Asien. *With Map.*

Translation of the notice by M. Deniker in *La Géographie.* Cf. *Journal*, vol. xvii. p. 303.

Ceylon. **Leclercq.**

Les Ruines d'Anouradhapoura (Ceylon). Communication faite au VII^{ème} Congrès International de Géographie à Berlin en 1899. Par M. Jules Leclercq. (Sonderabdruck aus den Verhandlungen des VII. Internationalen Geographen-Kongresses in Berlin, 1899.) Berlin, 1900. Size 10 × 7, pp. 598–606. *Presented by the Author.*

Ceylon. *Deutsche Rundschau G.* **23** (1901): 263–268. ———

Die Insel Ceylon. *With Map and Illustrations.*

China. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **18** (1901): 343–366. **Kramp.**

De grenslanden van China in het bijzonder Mandsjoerië. Door F. G. Kramp.

China. **Selby.**

As the Chinese See Us. By Thomas G. Selby. London: T. Fisher Unwin, 1901. Size 8 × 5, pp. 254. *Price 6s. Presented by the Publisher.*

In a series of cleverly written dialogues the writer endeavours to illustrate the Chinese point of view on various questions affecting the relations between China and Europe. His qualifications for the task are not stated, but he appears to speak with a considerable knowledge of Chinese history and modes of thought.

China—Kiauchau. *Globus* **79** (1901): 141–143. ———

Kiautschou im Jahre 1899–1900.

China—Manchuria. **Hosie.**

Manchuria, its People, Resources and Recent History. By Alexander Hosie. London: Methuen & Co., 1901. Size 9 × 6, pp. xii. and 294. *Map and Illustrations. Price 10s. 6d. net. Presented by the Publishers.*

This will be specially noticed.

China—Yunnan. **Litton.**
Trade of Ssumao and Mengtse for the year 1899. Foreign Office, Annual No. 2542, 1900. Size 9½ × 6, pp. 10. *Sketch-map. Price* 2½*d.*

The hopes of trade development entertained on the opening of Sumao to foreign commerce in 1897 have so far been falsified.

China and Central Asia. **Puini.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 401–422.
Alcune notizie sulle prime relazioni della Cina co' paesi d'Occidente. Memoria del Prof. Carlo Puini. *With Map.*

Chinese Turkestan. *J.R. Asiatic S.* (1901): 295–300. **Stein.**
Archæological Work about Khotan. By M. A. Stein, PH.D.

French Indo-China. *Rev. G.* **48** (1901): 283–299. **Massieu.**
Les territoires militaires du Tonkin. Par Mme Isabelle Massieu.

India. *Indian Antiquary* **30** (1901): 106–110. **Fleet.**
Notes on Indian History and Geography. By J. F. Fleet.

Identification of some ancient localities in South-West India.

India. *B.S.G. Lisboa* **17** (1898–1899): 355–367. **Pereira.**
De Lisboa a Cochim em 1505. Gabriel Pereira.

An account of the voyage to India of Francisco de Almeida, first viceroy, tran scribed from the manuscript volume of Valentim Fernandes, entitled 'De insulis et peregrinatione lusitanorum.'

India—Bengal. *Indian Antiquary* **30** (1901): 54–63, 81-97. **Stein.**
Notes on an Archæological Tour in South Bihar and Hazaribagh. By M. A. Stein, PH.D. *With Illustrations.*

India—Famine. *Imp. and Asiatic Quarterly Rev.* **11** (1901): 225–242. **Elliott.**
The Famine in India, 1899–1900. No. 1. By Sir Charles Elliott, K.C.S.I., etc.

India—Malabar. *B. Madras Gov. Museum (Anthropology)* **4** (1901): 66–78. ———
Nayādis of Malabar. *With Plates.*

On the lowest caste among the Hindus of Malabar.

India—Statistics. *J.R. Statistical S.* **64** (1901): 31–72. **Danvers.**
A Review of Indian Statistics. By F. C. Danvers. *With Diagram.*

Shows the general development of India since 1840.

Indian Ocean—Laccadives, etc. *B.S.G. Lisboa* **17** (1898–1899): 345-353. **Pereira.**
As ilhas de Dyve—Descripção anonyma do seculo xvi. Gabriel Pereira.

This anonymous account, which contains some interesting details respecting the Laccadives and adjoining island groups, is contained in the manuscript volume of Valentim Fernandes, now in the National Library at Lisbon.

Japan. *Deutsch. Rundschau G.* **23** (1901): 306–308. **Yokoyama.**
Der Ausbruch des Vulcans Adatara in Japan. Von Prof. Dr. M. Yokoyama. *With Map and Illustrations.*

This eruption of Adatara, a volcano of the central chain of Northern Japan, took place on July 7, 1900.

Japan—Hiogo and Osaka. **Hall.**
Trade of Hiogo and Osaka for the year 1899. Foreign Office, Annual No. 2564. 1901. Size 9½ × 6½, pp. 22. *Price* 1½*d.*

The manufacture and export of cotton yarn continue to increase rapidly, and the latter reached a total value of nearly two and a half millions in 1899. The total trade, however, decreased by over 7 per cent.

Japan—Railways. **Baltzer.**
M. Deutsch. Ges. Natur- u. Völkerkunde Ostasiens **8** (1900): 105–143.
Mittheilungen aus dem Japanischen Eisenbahnwesen und über den Plan einer Hochbahnverbindung in Tokyo. Von F. Baltzer. *With Map and Plans.*

Korea. *Izvestiya Imp. Russ. G.S.* **36** (1900): 463–501. **Schmidt.**
News from the Korea-Sakhalin Expedition. By — Schmidt. [In Russian.]

Korea. *Izvestiya Imp. Russ. G.S.* **36** (1900): 502-518. **Zvegintzov.**
Journey in Northern Korea. By A. Zvegintzov. [In Russian.] *With Map.*

Malay Archipelago. **Wichmann.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 18 (1901): 229–232.

Nog eens de Doif-eilanden. Door Prof. Dr. Arthur Wichmann.

Further notes on the cartographical history and nomenclature of an island group west of New Guinea.

Malay Archipelago—Borneo. **Spaan.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 18 (1801): 199–224.

Een landreis van Berouw naar Samarinda. Door A. H. Spaan. *With Map.*

On a journey through the eastern parts of the Kotei Sultanate.

Malay Archipelago—Borneo and Java. *B.S.R.G. d'Anvers* 25 (1901): 5–44. **Huysmans.**

Une exploration dans le Sultanat de Sambas (Bornéo) et un voyage dans l'île de Java. Par M. le Major Huysmans.

During a visit to the north-west division of Dutch Borneo the author took part in an expedition against the Dayaks, whom he thus describes from personal knowledge.

Malay Archipelago—Celebes. **Riedel.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 18 (1901): 225–228.

De Poïgar-rivier in het landschap Bolaäng Mongondou, Noord-Selebes. Door Dr. J. G. F. Riedel. *With Map and Plates.*

Malay Archipelago—Java. **Bodemeijer.**
Tijds. Indische Taal-, Land- en Volkenk. 43 (1901): 311–330.

Rapport naar aanleiding van de Nota betreffende het Tengger-gebied van den heer H. M. La Chapelle, opgenomen in deel xli. van het Tijdschrift voor Indische taal-, land- en volkenkunde. Door Ch. E. Bodemeijer.

A criticism of certain points in Mr. La Chapelle's paper.

Malay Archipelago—Java—Batavia. **Brandes.**
Tijds. Indische Taal-, Land- en Volkenk. 43 (1901): 248–274.

Een Plattegrond van Batavia van 1632. Door Dr. J. Brandes. *With Plate.*

On an old plan of Batavia represented on a medal now in the Teyler Museum at Haarlem.

Malay Archipelago—Lombok. **Eerde.**
Tijds. Indische Taal-, Land- en Volkenk. 43 (1901): 290–310.

Aanteekeningen over de Bodha's van Lombok. Door J. C. van Eerde.

On an agricultural tribe in Lombok.

Malay Archipelago—Timor. **Niermeyer.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 18 (1901): 274–276.

De Kustlijnen van Timor en Roti. Door J. F. Niermeyer. *With Map.*

On the rectifications introduced by the recent Dutch scientific expedition.

Persia. *Questions Dipl. et Colon.* 11 (1901): 284–289. **Tuillier.**

La Perse et sa situation intérieure. Par Dr. A. P. Tuillier.

Russia—Caucasus. *Izvestiya Imp. Russ. G.S.* 36 (1900): 227–298. **Bush.**

Description and preliminary results of a third Journey to the North-West Caucasus in 1899. By N. A. Bush. [In Russian.]

Russia—Caucasus. *Izvestiya Imp. Russ. G.S.* 36 (1900): 299–323. **Fomin.**

Preliminary Account of a Botanical-Geographical Excursion in the Eastern Caucasus. By A. V. Fomin. [In Russian.]

Russia—Caucasus. **Merzbacher.**

Aus den Hochregionen des Kaukasus. Wanderungen, Erlebnisse, Beobachtungen, von Gottfried Merzbacher. 2 vols. Leipzig: Duncker & Humblot, 1901. Size $10 \times 6\frac{1}{2}$, pp. (vol. i.) xxxviii. and 958, (vol. ii.) x. and 964. *Maps and Illustrations. Presented by the Author.*

A notice of this handsome work will be given elsewhere.

Russia—Siberia. **Berg and Ignatow.**

Les lacs salés Sélèty-Denghiz, Téké et Kizil-kak du district d'Omsk. Essai physico-géographique. Par L. Berg et P. Ignatow. [In Russian.] Moscow, 1901. Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. 162. *Maps and Illustrations. Presented by the Authors.*

This contains, in addition to the limnological matter, some information on the general physical geography and geology of the Omsk district, with a few notes on the Kirghiz.

Russia—Siberia. **Obruchef.**
Orographie und Tektonik Transbaikaliens auf grund neuester Russischer, von 1895–1898 ausgeführter Forschungen. Vortrag gehalten auf dem VII. Internationalen Geographen-Kongress in Berlin im Jahr 1899, von Berg-Ingenieur W. A. Obrutschew. (Sonderabdruck aus den Verhandlungen des VII. Internationalen Geographen-Kongresses in Berlin, 1899.) Berlin, 1900. Size 10 × 7, pp. 192–206. *Map.*

Russia—Siberia. **Seebohm.**
The Birds of Siberia. A Record of a Naturalist's Visits to the Valleys of the Petchora and Yenesei. By Henry Seebohm. London: John Murray, 1901. Size 9½ × 6½, pp. xx. and 512. *Map and Illustrations. Price* 12*s. net. Presented by the Publisher.*

A new edition, combined in one volume, of Mr. Seebohm's well-known works, entitled 'Siberia in Europe,' and 'Siberia in Asia,' which described his journeys in 1875–77 to the valleys of the Pechora and Yenesei. The work is produced in an attractive style, and deserves a place among the best productions of naturalist travellers.

Russia—Siberia. *Rev. G.* **48** (1901): 181–200. **Vallée.**
La Sibérie et le grand Transsibérien. Par Léon Vallée.

Russian Central Asia. *Ann. G.* **10** (1901): 148–164. **Saint-Yves.**
Transalaï et Pamirs. Par G. Saint-Yves. *With Plates.*
A Study in Central Asian Orography.

Russian Turkestan. *Izvestiya Imp. Russ. G.S.* **36** (1900): 332–336. **Bogdanov.**
Lake Chatir-kul. By P. Bogdanov. [In Russian.] *With Map.*

Turkey—Palestine. *B.S.G. Lille* **35** (1901): 228–246. ———
Notes sur la Palestine.

AFRICA.

Abyssinia. *Atti Terzo Congresso G. Italiano, Firenze* 1898 (vol. ii.): 206–219. **Perini.**
Il concetto dell' unità etiopica. Memoria del Capitano Ruffillo Perini.

The writer lays stress on the absence of unity both in the country and people of Abyssinia.

Algeria. *Le Globe, B.S.G. Genève* **40** (1901): 36–43. **Gautier.**
Causerie à propos de l'observation de l'éclipse totale de soleil du 28 mai 1900 en Algérie. Par M. le Prof. Raoul Gautier.

Algeria—Aures Mts. *Tour du Monde* 7 (1901): 133–156. **l'Harpe.**
Dans le sud Algérien. A travers les montagnes de l'Aurès et dans les Oasis du Souf. Par M. le Lieutenant de l'Harpe. *With Illustrations.*

Basutoland. **Weitzecker**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. i.): 237–244.
La Terra dei Basuto (Africa Australe) e i suoi abitanti. Conferenza del Cav. Giacomo Weitzecker.

British Bechuanaland. *Z. Ges. Erdk. Berlin* **36** (1901): 20–68. **Passarge.**
Beitrag zur Kenntnis der Geologie von Britisch-Betschuana-Land. Von Dr. Siegfried Passarge. *With Map and Illustrations.*

British Central Africa. **Chesnaye.**
A Journey from Fort Jameson to the Kafue River. By C. P. Chesnaye. (From the *Geographical Journal* for January, 1901.) Size 10 × 6½, pp. 8. *Map.*

British East Africa. *Monthly Rev.* (1901): 72–87. **Mardon.**
Trade and the Administration in British East Africa. By Evelyn J. Mardon.

British East Africa—Zanzibar. **Lyne.**
Zanzibar. Annual Report of the Agricultural Department. Zanzibar, 1899. Size 8 × 6½, pp. 34.

The prospects of young plantations of coffee, tea, and cacao, established at Dunga, are said to be encouraging.

Congo State. *B.S.R.G. d'Anvers* **24** (1901): 447–450. **Lemaire.**
Sur la mission scientifique du Katanga. Par M. le Capitaine Lemaire.
An account of the Lemaire expedition, read on October 24, 1900.

Congo State. *Mouvement G.* **18** (1901): 134–137. ——
La mission scientifique du Katanga.
Gives the preliminary results of astronomical and other observations made by the Lemaire expedition.

Congo State—Coffee. *B.S. d'Études Colon.* **8** (1901): 109–116. **Gentil.**
Établissement d'une plantation de caféiers au Congo. Par Louis Gentil.

Congo State—Tsetse fly. *B.S.R.G. d'Anvers* **24** (1901): 451–473. **Lemaire.**
Au Congo. Note sur la mouche tsétsé. Par M. le Capitaine Lemaire.
Describes the author's search, during his journey across Africa, for specimens of the tsetse fly, with a view to determining its range.

Dahome—Railway. *Mouvement G.* **18** (1901): 145–149. ——
Le Chemin de fer du Dahomey. *With Map.*

Egypt—Eastern Desert. *Geolog. Mag.* **8** (1901): 154–161. **Barron and Hume.**
Notes on the Geology of the Eastern Desert of Egypt. By T. Barron and W. F. Hume, D.SC.

French Congo. *Questions Dipl. et Colon.* **11** (1901): 323–329. **Bernard.**
Les territoires du Chari et l'œuvre de M. Gentil. Par M. A. Bernard. *With Map.*

French Congo. *B. Comité l'Afrique Française* **11** (1901): 105–109. **Bernard and Huot.**
La mission Chari-Sangha. Par M. V. Bernard et le dr. Huot. *Map.*

French Congo. *La G., B.S.G. Paris* **3** (1901): 197–202. **Huot.**
Mission Chari-Sangha. Par le Dr. Huot. *With Map.*
These two papers give a full account of the journey described at p. 305 of vol. xvii of the *Journal.*

French Congo. *La G., B.S.G. Paris* **3** (1901): 109–114. **Julien.**
De Ouango à Mobaye par les pays n'sakara et bougbou (29 Mars—9 Avril 1899). Par M. Julien. *With Map and Illustrations.*

French Congo. *B. Comité l'Afrique Française* **11** (1901): 100–104. **Terrier.**
La région du Chari et la Mission Gentil. Par Auguste Terrier. *With Map and Illustration.*
Gives information as to the organization of the Shari territory.

French Congo. *Mouvement G.* **18** (1901): 137–140. **Wauters.**
Le problème du Wam. Par A. J. Wauters. *With Map.*

French Guinea. *Ann. G.* **10** (1901): 165–176. **Chevalier and Cligny.**
La Casamance. Par MM. A. Chevalier et Ad. Cligny. *With Plates.*

French West Africa. *Miss. Catholiques* **33** (1901): 94, 106, 117, 128, 174. **Hacquard.**
Promenade au Mossi. Par Mgr. Hacquard. *With Map and Illustrations.*

French West Africa—Ivory Coast. *La G., B.S.G. Paris* **3** (1901): 219–221. **Noll.**
La mission du lieutenant Dromard. Par Ned Noll. *With Map.*
On surveys in the region east of the lower Kavalli.

French West Africa—Senegal. *B.S.G. de l'Est* **22** (1901): 61–71. **Rambaud.**
Voyage au Sénégal. Par M. Pierre Rambaud.

German East Africa. *M. Deutsch. Schutzgeb.* **14** (1901): 20–39. **Beringe.**
Aus den Berichten des Herrn v. Beringe über seine Reisen im Gebiet der Kirunga-vulkane. *With Map and Illustrations.*
See note in May *Journal* (vol. xvii. p. 529).

German East Africa. *M. Deutsch. Schutzgeb.* **14** (1901): 40–61. **Böhler.**
Denkschrift zur Karte von Ost-Usambara. Von Böhler. *With Map and Illustrations.*
The map is the result of a survey commenced in 1896 for the fixing of the limits of land-concessions in Usambara. It is on the scale of 1 : 50,000.

German South-West Africa. *Deutsche Rundschau G.* **23** (1901): 252–258. **Dinter.**
Kreuz- und Querzüge in Deutsch-Südwest-Afrika. Von Kurt Dinter. *With Illustrations.*

German South-West Africa. *Globus* 79 (1901): 41–44. **Kannengiesser.**
Deutsch-Südwestafrika im Jahre 1900. Von G. A. Kannengiesser.

The writer thinks that the threatened influx of Boers in the south, and the English mining enterprise in the north, must be met by increased German immigration.

German South-West Africa. *Deutsch. Kolonialblatt* 12 (1901), 186–189. **Lindequist.**
Die wirthschaftlichen Aussichten Deutsch-Sudwestafrikas im Vergleich mit dem übrigen Sudafrika.

The writer considers that German South Africa is in no way inferior to the greater part of the British territory from an economic point of view.

Kamerun. *Deutsch. Kolonialblatt* 12 (1901): 183-186. **Von Stein.**
Forschungsexpedition im südöstlichen Kamerun.

Describes the expedition up the Ngoko already referred to in the *Journal* (vol. xvii. p. 431). Lieut. von Stein gives to the upper river a direction from the north, which differs from that assigned to it by the late Dr. Plevn.

Madagascar. *La G., B.S.G. Paris* 3 (1901): 89–108. **Colin.**
Deux missions scientifiques sur les côtes occidentale et orientale de Madagascar. Par E. Colin, S.J. *With Illustrations.*

Marocco. *Z. Ges Erdk. Berlin* 35 (1900): 365–417. **Fischer.**
Zur Klimatologie von Marokko. Von Prof. Dr. Theobald Fischer. *With Map.*

A note on this paper will be given.

Marocco. *Meteorolog. Z.* 18 (1901): 76–79. **Hann.**
Klima der Westküste von Marokko, Mogador. Von J. Hann.

Marocco. *Le Globe, B.S.G. Genève* 12 (1900–1901): 64–77. **Tavel.**
Récits de voyage au Maroc. Par M. le prof. Dr. E. Tavel.

Deals only with the better-known parts of Marocco.

Portuguese West Africa—Angola. **Nightingale.**
Trade of Province of Angola for the year 1899. Foreign Office, Annual No. 2555, 1901. Size 10 × 6½, pp. 18. *Price* 1½*d.*

The imports from Germany show an increase of £32,450, while those from the United Kingdom had decreased by £1750; but it is hinted that this may be due to want of caution on the part of German traders, who sometimes suffer severe losses in consequence. Though still resulting in a deficit, the working of the railway shows increased receipts and diminished expenses as compared with 1890.

Sahara. *B.S.G. Lyon* 17 (1901): 138–145. **Foureau.**
La traversée du Sahara. Par M. Foureau.

Sahara. *B.S.G. Lyon* 17 (1901): 168–174. **Tignol.**
La Mission Blanchet. Par M. L. Tignol.

Sahara—Tuat. *Rev. Française* 26 (1901): 222–227. **Vasco.**
L'occupation du Touat. Par G. Vasco. *With Map.*

St. Helena. **Sterndale.**
St. Helena. Report for 1899. Colonial Reports, Annual No. 309, 1900. Size 9½ × 6, pp. 16. *Price* 1*d.*

South Africa. *J.R. Colonial I.* 32 (1901): 301–337. **Wallace.**
Agriculture in South Africa. By Prof. Robert Wallace.

Prof. Wallace's opinion, that South Africa will never be developed through its agriculture, elicited a considerable amount of criticism in the discussion which followed the paper.

South Africa—Basutoland. ——
Basutoland. Report for 1899–1900. Colonial Reports, Annual No. 313, 1901. Size 9½ × 6, pp. 68. *Price* 3½*d.*

Spanish Colonies. *B.S.G. Madrid* 42 (1900): 174–188. **Conrotte.**
Colonias españolas en Africa y métodos apropiados á su explotación. Por D. Manuel Conrotte.

Spanish West Africa. *B.S.G. Madrid* 42 (1900) (Separate Memoir, 74 pp.). **Duro.**
El Derecho á la ocupación de territorios en la Costa occidental de Africa

discutido en la Conferencia internacional de Paris en los años de 1886 á 1891. Por D. Cesáreo Fernández Duro.

On the Spanish claims to territory in West Africa, and the history of the negotiations with France.

Tunis. *Rev. Française* **26** (1901): 227–230. **Barré.**

Le Djérid Tunisien. Par P. Barré.

Tunis. *Rev. Française* **26** (1901): 129–135. **Demanche.**

L'invasion sicilienne en Tunisie. Par M. G. Demanche.

On the ever-increasing Italian immigration into Tunis.

Tunis. *Travel* **5** (1901): 544–552. **Sloan.**

Off the Beaten Track; or, with Caravan, Camp, and Camera into the Interior of Tunisia. By the Rev. A. D. Sloan. *With Illustrations.*

Description of a trip south-east from Kairwan.

Tunis—Uthina. *Rendiconti R.A. Lincei* **9** (1900): 681–688. **Cesano.**

La Colonia di Uthina. Nota della sig^na Lorenzina Cesano.

Uthina was one of the oldest Roman colonies in the province of Africa.

West Africa. *Ann. Hydrographie* **29** (1901): 104–111. **Kutter.**

Zur Küstenkunde Westafrikas. Aus dem Reisebericht S.M.S. "Habicht," Kommandant Korv.-Kapt. Kutter. *With Chart.*

The chart shows the Congo mouth and its islands, which are said to be incorrectly drawn in the British Admiralty chart.

West Africa—Historical. **Gomes and Pereira.**
B.S.G. Lisboa **17** (1898–1899): 267–293.

Diogo Gomes—As relações do descobrimento da Guiné e das ilhas dos Açores, Madeira e Cabo Verde, versão do latim por Gabriel Pereira.

A Portuguese version of the narratives of Diogo Gomes, relating to the discovery of Guinea and the Atlantic archipelagoes, written in Latin by Martin Behaim, and included in the collection of Valentim Fernandes.

West Africa—Kola. *M. Deutsch. Schutzgeb.* **14** (1901): 8–14. **Zech.**

Ueber Kola in Westafrika. Von Graf Zech. *With Illustrations.*

A note on this paper appears elsewhere.

West Africa—Railways. *Questions Dipl. et Colon.* **11** (1901): 401–415. **Aspe-Fleurimont.**

La question des Chemins de fer dans l'Afrique occidentale. Par M. Aspe-Fleurimont.

On the best means of providing railways for French West Africa.

NORTH AMERICA.

America—Norse Discoveries. *B. American G.S.* **33** (1901): 1–18. **Dieserud.**

Norse Discoveries in America. By Juul Dieserud.

Canada. *Church Miss. Intelligencer* **52** (1901): 182–194. **Lofthouse.**

In a Desolate Land. Journal of Archdeacon Lofthouse. *With Map.*

Account of a journey of 3000 miles from Winnipeg across the Barren Lands to Hudson bay, and back.

Canada—Lake Basins. *Geolog. Mag.* **8** (1901): 97–101. **Parkinson.**

Some Lake Basins in Alberta and British Columbia. By J. Parkinson. *Plate.*

Canada—New Brunswick. **Ganong.**
B. Nat. Hist. S. New Brunswick **4** (1901): 313–340.

Notes on the Natural History and Physiography of New Brunswick [*continued*]. By W. F. Ganong. *With Maps.*

Canada—Rocky Mountain Region. *B. Geolog. S. America* **12** (1901): 57–92. **Dawson.**

Geological Record of the Rocky Mountain Region in Canada. Address by the President, George M. Dawson.

Canada—Rocky Mountains. **Collie.**

Exploration in the Canadian Rocky Mountains. By Prof. J. Norman Collie, F.R.S. (From the *Geographical Journal* for March, 1901.) Size 10 × 6½, pp. 22. *Map and Illustrations.*

Mexico. **Biorklund.**
Trade of Mexico for the year 1899. Foreign Office, Annual No. 2546, 1901. Size 9½ × 6, pp. 46. *Price* 2½*d.*

This is the second report on Mexican trade in 1899 issued within the last few months (cf. *Journal*, vol. xvii. p. 452).

Newfoundland. *Rev. G.* 48 (1901): 201–210. **Charpentier.**
La question du French Shore. Par M. Charpentier. *With Map.*

Newfoundland. *Fortnightly Rev.* 69 (1901): 359–363. **Willson.**
The Newfoundland Question. Is a Present Settlement with France desirable? By Beckles Willson.

The writer urges that, instead of indemnifying France for the cession of her supposed rights, the duty of Great Britain is to compensate the colonists for wrongs done to them, not by France, but by the Imperial Government through the allowance of French pretensions. The distinction seems somewhat academical.

United States. *American J. Sci.* 11 (1901): 185–190. **Gould.**
Notes on the Geology of parts of the Seminole, Creek, Cherokee, and Osage Nations. By C. N. Gould.

On the results of a reconnaissance in the north-west of the Indian territory and a part of Oklahoma.

United States—Arkansas. *J. Geology* 9 (1901): 47–50. **Purdue.**
Valleys of Solution in Northern Arkansas. By A. H. Purdue. *With Illustrations.*

On examples of valleys due to the differential solution of the rocks of a district.

United States—Chicago. **Wyndham.**
Trade of Chicago and District for the year 1900. Foreign Office, Annual No. 2566, 1901. Size 10 × 6½, pp. 66. *Price* 3½*d.*

It is stated that the buyers of more than twenty states now make most of their purchases in Chicago, while within a radius of 500 miles there is a population of over 40,000,000.

United States—Cotton. *Export* 23 (1901): 186–188. ———
Die amerikanische Baumwoll-Produktion und Industrie.

Translation of an article in the *Times*.

United States—Indiana. *J. Geology* 9 (1901): 123–129. **Dryer.**
Certain peculiar Eskers and Esker Lakes of North-Eastern Indiana. By C. R. Dryer. *With Sketch-maps.*

United States—Kansas and Oklahoma. *American J. Sci.* 11 (1901): 263–268. **Gould.**
Tertiary Springs of Western Kansas and Oklahoma. By C. N. Gould.

It is often these springs alone which permit stock farming over large areas.

CENTRAL AND SOUTH AMERICA.

Andes. *La G., B.S.G. Paris* 3 (1901): 261–278. **Rabot.**
Le conflit chilo-argentin et les phénomènes de capture dans la Cordillère des Andes. Par Charles Rabot. *With Map and Illustrations.*

Argentine Republic. **Lahille.**
Informe preliminar del Viaje de Exploración del *Azopardo* al Golfo San Matias. Por el doctor F. Lahille. Buenos Aires, 1900. Size 8½ × 5½, pp. 78.

A brief outline of the scientific results of the voyage of the *Azopardo* in 1899.

Brazil. *Petermanns M.* 47 (1901): 49–53. **Katzer.**
Das Gebiet an der Mündung des Trombetas in den Amazonas. Von Dr. Friedrich Katzer. *With Map.*

Brazil. **Temple.**
Trade of Pará for the year 1900. Foreign Office, Annual No. 2580, 1901. Size 9½ × 6, pp. 26. *Diagram. Price* 3½*d.*

Brazil and French Guiana. ———
Frontières entre le Brésil et la Guyane Française. Mémoire présenté par les États Unis du Brésil au Gouvernement de la Confédération Suisse, Arbitre choisi selon les stipulations du Traité conclu à Rio-de-Janeiro, le 10 Avril 1897 entre le Brésil et la France. 6 vols. Vols. iv. and v.—L'Oyapoc et l'Amazone. Par

Joaquin Caetano da Silva. Vol. vi. Atlas. Paris: A. Lahure, 1899–1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$: Atlas, $22\frac{1}{2} \times 16$, pp. (vol. i.) xviii. and 278; (vol. ii.) iv. and 196; (vol. iii.) 262; (vol. iv.) xxxviii. and 460; (vol. v.) 506. *Maps. Presented by the Brazilian Government.*

British Honduras. **McKinney.**
British Honduras. Report for 1899. Colonial Report, Annual No. 310. 1900. Size $9\frac{1}{2} \times 6$, pp. 30. *Price 2d.*

Although mahogany and logwood still play a preponderating part in the list of exports, it is stated that there are grounds for hoping that an agricultural industry may in time be organized.

Costa Rica and Colombia. *Rev. Française* **26** (1901): 168–171. ——
L'arbitrage entre Costa-Rica et Colombie. Par G. V. *With Map.*

French and Brazilian Guiana. **Breukelman.**
Tijds. K. Ned. Aard. Genoots. Amsterdam **18** (1901): 262–271.
De beslissing in het Fransch-Braziliaansch geschil. Door J. B. Breukelman. *With Map.*

French Guiana and Brazil. *B.S.R.G. d'Anvers* **24** (1901): 480–485. **Georlette.**
Le Contesté franco-brésilien. L'Aricary. Par M. F. A. Georlette. *With Map.*

On the recent boundary award.

Grenada. **Probyn.**
Grenada. Report for 1899. Colonial Reports, Annual No. 316, 1900. Size $9\frac{1}{2} \times 6$, pp. 54. *Price 3d.*

Leeward Islands. **Gordon.**
Leeward Islands. Report for 1899. Colonial Reports, Annual No. 308, 1900. Size $9\frac{1}{2} \times 6$, pp. 48. *Price 2½d.*

Peru. *Deutsche Rundschau G.* **23** (1901): 259–262. **Nusser-Asport.**
Expedition Viellerobe vom Ucayali zum Inambary. Von Chr. Nusser-Asport.

This expedition was referred to in the *Journal* for 1899 (vol xiv. p. 214).

St. Lucia. **Egerton.**
Saint Lucia. Report for 1899. Colonial Reports, Annual No. 311, 1900. Size $9\frac{1}{2} \times 6$, pp. 38. *Price 2½d.*

St. Vincent. **Drayton.**
St. Vincent. Report for 1899. Colonial Reports, Annual No. 312, 1901. Size $9\frac{1}{2} \times 6$, pp. 26. *Price 2d.*

Venezuela. *B.S.G. Com. Bordeaux* **27** (1901): 109–112. **Humbert.**
Un Gibraltar ignoré. Par M. J. Humbert.

The Gibraltar in question is a small town at the southern extremity of the Lake of Maracaibo, which has been the scene of some important historic events.

West Indies—Agricultural Conference. *West Indian B., Extra No.*, pp. 22. ——
Report of Proceedings at the West Indian Agricultural Conference, 1901.

At this conference, which met in January last, a number of questions relating to the agricultural development of the West Indies were discussed.

AUSTRALASIA AND PACIFIC ISLANDS.

Hawaii—Sugar-planting. **Rossi.**
Le Piantagioni di Canna da Zucchero nelle Isole Hawaii. Rapporto del cav. Egisto Rossi. (B. Ministero Affari Esteri, Marzo, 1901.) Size $9 \times 6\frac{1}{2}$, pp. 16.

New South Wales. **Coghlan.**
Agriculture in New South Wales, pp. 48. Forty years of Progress in New South Wales, p. 8. The climate of New South Wales, pp. 10. *Map and Section.* The Fauna of New South Wales, pp. 16. The mining industry of New South Wales, pp. 42. *Map.* The timber resources of New South Wales, pp. 16. All by T. A. Coghlan. Sydney, 1900. Size $9 \times 5\frac{1}{2}$. *Presented by the Agent-General for New South Wales.*

New South Wales. *Records Australian Museum* **4** (1901): 17–21. **North.**
The Destruction of Native Birds in New South Wales. By Alfred J. North.

New Zealand. *J. Polynesian S.* **9** (1900): 211–233. **Smith.**
The *Aotea* Canoe. The Migration of Turi to Aotea-Roa (New Zealand). Translated and Annotated by S. Percy Smith.

An account, from native sources, of the arrival of a party of settlers on the Taranaki and Cook strait coasts, about A.D. 1350.

Oceania—Railways. *Rev. G.* **48** (1901): 211–217. **Barré.**
Les chemins de fer océaniens. Par Paul Barré.

The railways of the Malay archipelago are included.

Pacific Fauna. *P.A. Nat. Sci. Philadelphia* (1900): 568–581. **Pilsbry.**
The Genesis of Mid-Pacific Faunas. By Henry A. Pilsbry.

Place-names. *R.G.S. Australasia (Victoria)* **18** (1900): 7–29. **Forbes.**
Orthography of Geographical Place-names. By E. J. Forbes.

This paper is a plea for system in the bestowal of names to new places. In the discussion which followed, considerable differences of opinion were expressed, some of the speakers advocating native, others English, names.

Samoa. **Trood.**
Trade of Samoa for the year 1900. Foreign Office, Annual No. 2561, 1901. Size 10 × 6½, pp. 8. *Price ½d.*

The planting of cacao is now engaging much attention. Coffee has been a failure owing to disease, but vanilla, kola, and rubber are more promising.

POLAR REGIONS.

Greenland. *G. Tidskrift* **16** (1901): 34–54. **Amdrup.**
Den østgrønlandske Kystexpedition 1900. Ved Premierløjtnant G. Amdrup. *With Map.*

Greenland—Denmark Island. *Meteorolog. Z.* **18** (1901): 5–10. **Woeikof.**
Klima und Föhne der Dänemark-Insel, Scoresby-Sund. Von A. Woeikof.

Spitsbergen. **Conway.**
The Rise and Fall of Smeerenburg, Spitsbergen. By Sir Martin Conway. (Privately printed.) Size 10 × 6½, pp. 24. *Presented by the Author.*

An interesting account of European (principally Dutch) whaling enterprise in Spitsbergen in the seventeenth century.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Moraines. *Sitzb. A.W. München* (1900): 533–540. **Finsterwalder.**
Ueber die innere Struktur der Mittel-moränen. Von S. Finsterwalder. *Illustr.*

Oceanography. **Chun.**
Aus den Tiefen des Weltmeeres. Von Carl Chun. Schilderungen von der Deutschen Tiefsee-Expedition. Jena: G. Fischer, 1900. Size 11 × 8, pp. viii. and 550. *Map and Illustrations.*

This will be noticed elsewhere in the *Journal.*

Oceanography—Map. *B.S.G. de l'Est* **22** (1901): 5–22. **Thoulet.**
Projet d'une carte générale des grandes profondeurs océaniques. Par M. J. Thoulet.

Seismology. *B. Comité Géolog. St.-Pétersbourg* **19** (1900): 31–53. **Montessus-de-Ballore.**
Les régions Balkaniques et l'Anatolie Séismique. F. de-Montessus-de-Ballore. [In Russian, with *résumé* in French.] *With Map.*

Sonorous Sand. *Sitzb. A.W. München* (1901): 15–33. **Günther.**
Akustisch-Geographische Problème. Von S. Günther.

The writer proposes to collect and discuss the material now available on the subject of natural acoustic phenomena, and begins in this paper with that of sonorous sand.

Zöo-geography. *C. Rd.* **132** (1901): 802–805. **d'Herculais.**
Le grand Acridien migrateur américain (*Schistocerca americana*, Drury): migrations et aire de distribution géographique. Note de M. J. Künckel d'Herculais.

GENERAL.

Exploration. **Stanley.**

Fields for Future Explorers. By Sir Henry M. Stanley. (From the *Windsor Magazine*, January, 1901, pp. 201–206.) Size 10 × 6½. *Map and Illustrations.*

Hints to Travellers. **Coles.**

Hints to Travellers, scientific and general. Edited for the Council of the Royal Geographical Society, by John Coles. Eighth Edition, Revised and Enlarged. 2 vols. Vol. i.—Surveying and Practical Astronomy. Vol. ii.—Meteorology, Photography, Geology, Natural History, Anthropology, Industry and Commerce, Medical, etc. London: Royal Geographical Society, 1901. Size 7 × 5, pp. (vol. i.) x. and 436; (vol. ii.) viii. and 266. *Maps and Illustrations. Price* 15*s. net.*

In this edition, not only has the whole subject-matter been thoroughly revised and enlarged, but two sections, those on meteorology and medical hints, have been entirely re-written, by Dr. H. R. Mill and Dr. W. H. Crosse respectively. The work is for the first time divided into two volumes, the first of which deals solely with surveying and practical astronomy, and includes a complete set of trigonometrical tables for the computation of results, taken, by permission, from Raper's well-known treatise.

Hydrography. ———

Account of the operations of the Marine Hydrographical Department of the Ministry of Marine, 1898. [In Russian.] St. Petersburg, 1899. Size 9½ × 6½, pp. 460 and 24. *Maps.*

Ice-navigation. *Scottish G. Mag.* **17** (1901): 175–185. **Gulston.**

Some Notes on the Baltic and Arctic Voyages of the *Ermack* in 1899. By Arthur Gulston.

Irrigation. **Jung.**

Beiträge Kolonialpolitik u. Kolonialwirtschaft **2** (1900–1901): 353–363.

Künstliche Bewässerung und ihre Anwendung in unseren Kolonien. Von Dr. Emil Jung.

Malaria. **Stephens and Others.**

Reports to the Malaria Committee of the Royal Society. Third Series. London: Harrison & Sons, 1900. Size 8½ × 5½, pp. 46. *Map, Plans, and Diagrams. Price* 2*s. Presented by the Royal Society.*

This instalment contains reports by Drs. Stephens, Christophers and Daniels, dealing, among other subjects, with malarial fever on railways under construction, the distribution of *Anopheles* in Africa, and the question of prophylaxis.

Meat Trade. *Deutsch. G. Blätter* **24** (1901): 25–35. **Jung.**

Viehstand und Fleischhandel in Nord-amerika, Australien und den La Plata-Staaten. Von Dr. Emil Jung.

Medical Geography—Malaria. *Nature* **63** (1901): 494–497. **Fielding-Ould.**

Malaria and its Prevention. By Dr. R. Fielding-Ould. *Chart and Illustration.*

Spanish Colonies. *B.S.G. Madrid* **42** (1900) (*Separate Memoir*, 110 pp.) **Labra.**

Las Colonias españolas después del Tratado de Paris de 1898. Por D. Rafael M. de Labra.

Time Signals. ———

List of Time Signals, established in various parts of the World. Sixth Edition, 1901. London: J. D. Potter. Size 10 × 6½, pp. 82. *Price* 1*s. Presented by the Hydrographer, Admiralty.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Bartholomew.**

Reduced Ordnance Survey of England and Wales. Scale 1 : 126,720 or 2 stat. miles to an inch. Sheet: 14, Lincoln Fens. J. Bartholomew & Co., Edinburgh, 1901. *Price* 2*s. Presented by the Publishers.*

England and Wales. **Johnston.**

Cycling and Automobile Maps of London and the East, London and the West, London and the South, and Environs of London. Scale 1 : 190,080 or 3 stat. miles to an inch. W. & A. K. Johnston, Edinburgh & London. *Price 1s. 6d. each sheet. Presented by the Publishers.*

These are sheets of Johnston's "Three Miles to an Inch" map of England and Wales, arranged to include the districts for about 60 miles to the east, west, and south of London, and a general map of the environs of London, with circles drawn at intervals of 3 miles from St. Paul's, and the roads suitable for cyclists shown in red. The scale is small, but they will be useful when no map on a larger scale is available. Contours at intervals of 500 feet are shown, but these are, of course, too few and far between to be of much use to the cyclist.

England and Wales. **Ordnance Survey.**

Ordnance Survey of England and Wales :—Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from May 1 to 31, 1901.

6-inch—County Maps :—

Carnarvonshire, 8 S.E., 12 N.W., 16 N.E., 21 N.W., 22 N.E., S.W., 27 S.E., 34 N.E., 34 S.W., 36 N.E., 40 N.E. (40 S.E. and 41 S.W.), 42 N.E., 43 S.E., 44 N.E., 44 S.W., 45 S.W., 46 S.W. **Cumberland,** 3 N.E., S.E., 4 S.W., 8 N.W., N.E., 9 N.E., S.W., 12 N.E., S.E., 15 N.E., 16 N.W., 18 S.W., S.E., 21 S.W., 22 N.W., 23 N.W., S.E., 24 S.E., 26 N.W., S.W., 30 S.E., 33 N.E., 34 N.E. **Derbyshire,** 45 N.W., 46 N.W., 48 N.E., 50 S.E., 56 N.E. **Glamorgan,** 3 N.W., S.W., 19 N.W. **Merionethshire,** 12 N.E., 18 N.E. **Northamptonshire,** 6 S.W., 11 S.W., 12 S.W., 15 S.W., 19 N.W., 24 S.E., 25 N.E., 26 S.W., 33 N.W., 38 S.W., 44 S.E., 46 S.W. **Nottinghamshire,** 37 N.W., 38 S.E., 45 N.E. **Wiltshire,** 15 N.E., 25 S.E., 45 S.E., 48 S.W., 61 N.E. 1*s. each.*

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(*E. Stanford, London Agent.*)

Greece. **Grundy.**

Murray's Handy Classical Maps, Græcia. Scale 1 : 633,600 or 10 stat. miles to an inch. Edited by G. B. Grundy, M.A., of Brasenose College, Oxford. London: John Murray, 1901. *Price* 1*s.* 6*d.* 2 *sheets. Presented by the Publisher.*

This is another of Murray's Handy Classical Maps, edited by Mr. G. B. Grundy. An attempt has been made to show the relief by means of a combination of contour-lines and colour-tinting which is not altogether satisfactory, partly owing to the fact that there is not sufficient difference between some of the tints selected, and still more because all plains, at whatever elevation they may be, are shown by one tint of bright green, which, in connection with the orographical tinting, tends to confusion, for naturally one supposes that, in keeping with the rest of the map, all parts coloured in the same way are of one altitude, notwithstanding the explanatory note given. It seems to have been a mistake to attempt two systems of colouring on the same map. Ancient names only are given, and, like the others of the series, the map, which is in two parts, is accompanied by an index to place-names.

Norway. **Norges Geografiske Opmaaling.**

Topografisk Kart over Kongeriget Norge. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheets: Bratfjeldet, Fraaholmen, Ljördalen, Storelvedalen, Lodshavn, Egersund, Söndre Osen, Engerdalen, Röst, Skibaasvaer, Ranen, Vardö, Ranseren,

Kiberg, Tana, Bievra, Naesseby.—Norges Geologiske Undersögelse, 1 : 100,000. Sheet: Lillehammer. Norges Geografiske Opmaaling, Kristiania. *Presented by the Norges Geografiske Opmaaling.*

Switzerland. **Swiss Federal Staff.**

Topographischer Atlas der Schweiz. Scale 1 : 25,000. Sheets: Anthy, Beurnevésin, Rankweil, Wesen, Cryon.—1 : 50,000. Sheets: Glurns, Chiavenna. *Price 1 mark each sheet. Presented by the Swiss Federal Staff.*

Vienna. **Artaria.**

Plan der K. K. Reichshaupt und Residenzstadt Wien. Scale 1 : 25,000 or 0·4 stat. mile to an inch. Wien: Artaria & Co., 1901. *Price 2k. Presented by the Publishers.*

ASIA.

Asia. **Service Géographique de l'Armée, Paris.**

Asie. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. Sheet: Hanoi. Service Géographique de l'Armée, Paris. *Price 1.25 fr.*

Japan. **Japanese Government.**

Map of Japan. Scale 1 : 50,000 or 0·8 stat. mile to an inch. Japanese Government. *Presented by K. Otani, Esq.*

These sheets of the Government survey of Japan include the eastern part of the island of Niphon, extending for about 100 miles to the south-west of Tokio. Elevations are shown by an elaborate series of contour-lines at intervals of 20 feet, and a great deal of detail is given. The lettering is in native character only.

Palestine. **Bartholomew and Smith.**

Topographical and Physical Map of Palestine. By J. G. Bartholomew, F.R.S.E., etc. Edited by George Adam Smith, D.D., LL.D. Scale 1 : 253,440 or 4 stat. miles to an inch. J. Bartholomew & Co., Edinburgh, 1901. *Prices: in sheets unmounted, 5s.; mounted on cloth and in case, 7s. 6d.; mounted on rollers and varnished, 12s. 6d. Presented by the Publishers.*

By means of a system of colour-tinting and contours, similar in general appearance to that employed in their well-known reduced Ordnance maps of the British Isles, Messrs. Bartholomew have succeeded in producing a map of Palestine which shows clearly the leading physical features and characteristics of the country, and will doubtless be useful to students and tourists. Ten shades of green and brown have been selected to represent the altitudes of the land from the level of the Mediterranean sea to over 7000 feet, the intervals being every 500 feet up to 2000, and then every 1000 feet. The altitudes below the level of the Mediterranean are specially distinguished, and the depths of the seas are shown by tints of blue for every 500 feet. There are also given as insets, a vegetation map of modern Palestine, a plan of Jerusalem, vertical sections across the country from Jaffa to the plains of Moab, and from Mt. Carmel across the Sea of Galilee to the Jaulan plateau, and, for comparison, a small plan of the environs of London on the same scale as the principal map. Bible and ancient names are distinguished from modern names by the style in which they are written, and an explanation is given of Arabic geographical terms.

AFRICA.

Algeria. **Service Géographique de l'Armée, Paris.**

Carte d'Algérie. Scale 1 : 50,000 or 0·8 stat. mile to an inch. Sheets: Oued Okris, Mansourah, St. Donat. Service Géographique de l'Armée. Paris. *Price 1.50 fr. each sheet.*

Somaliland. **Istituto Cartografico Italiano.**

Carta della Costa Orientale d'Africa da Obbia a Dares-Salem e della Somalia Meridionale. Scale 1 : 500,000 or 7·8 stat. miles to an inch. Sheets: Lugh, Mogadiscio, Meregh, Goscia, Brava. Istituto Cartografico Italiano, Rome, 1899.

These five sheets form part of a map of the southern part of Italian Somaliland and the country to the south as far as Zanzibar, which is now in course of publication by the Italian Military Geographical Institute, and which will consist altogether of thirteen sheets. The area included on the sheets already received lies between the equator and 5° N. lat., and between 38° E. long. and the coast. Much of this region is very imperfectly known, consequently a good deal that is laid down on the sheets is hypothetical, and many blank spaces exist owing to the entire lack of information.

Tunis. **Service Géographique de l'Armée, Paris.**

Carte de Tunisie. Scale 1 : 50,000 or 0·8 stat. mile to an inch. Sheets: Oued Sedjenan, Oued Zerga. Service Géographique de l'Armée. Paris. *Price 1.50 fr. each sheet.*

West Africa. **Chastrey.**

Hydrographie du Congo et de l'Oubanghi de Brazzaville au Poste d'Abiras, avec leurs affluents rive droite d'après les travaux des diverses Missions de 1883 à 1901. Scale 1 : 800,000 or 12·7 stat. miles to an inch. By Henry Chastrey. To be obtained of the author at 24 rue du Fer-à-Moulin, Paris. *Price* 30 *fr.*

This map includes the course of the lower Congo from Brazzaville, on Stanley Pool, to the confluence of the Ubangi, and then gives the latter river as far as Abiras, situated about 50 miles east of its great northern bend. It also includes the river Sangha and other smaller tributaries which flow into the Congo and Ubangi from the west. The author, who was with Meister on the Congo, is evidently well acquainted with the region, and from his own notes and surveys has succeeded in producing a map which gives fresh detailed information concerning the courses of these important rivers, basing it upon astronomical observations and surveys of other explorers, especially those of Commandant Rouvier. The map ought to prove of service to future travellers, and shows the speed of the current, position of rocks, depth of water, sandbanks at mean low water, and in addition, indicates the track that can safely be followed up the rivers during the night. In many particulars the map differs from those previously published, and as regards the lower Congo, from that showing the surveys of Rev. G. Grenfell, which has been presented to this Society. The latitude and longitude of some of the important places are entirely different from those shown on the latter map; but, as M. Chastrey does not appear to have taken any astronomical observations himself, his map, although useful for detail, cannot be considered as authoritative on such matters. Owing to erosion, considerable alteration is continually taking place in the sandbanks and channels of the rivers, and the author has therefore arranged to make use of all fresh information as he receives it, and keep his map up to date. The map has been heliographed, and is in appearance a somewhat rough production. Three hundred copies only have at present been printed.

AMERICA.

British Columbia. **Lands and Works Department, Victoria, B.C.**

Map of the Yale District, and portions of adjacent districts of British Columbia. Scale 1 : 500,000 or 7·8 stat. miles to an inch. Lands and Works Department, Victoria, B.C., 1900. *Presented by H. G. Slade, Esq.*

No hill work is given on this map. It, however, shows very clearly lakes, rivers, and creeks in blue; railways and roads in black; and boundaries with the names of the divisions in red. Land-blocks are also indicated and numbered, and altogether the map will be very useful for general reference.

Mexico. **Bureau of the American Republics.**

Maps of Mexico showing Minerals and Agriculture. Scale 1 : 3,168,000 or 50 stat. miles to an inch. Prepared in the Bureau of the American Republics, W. W. Rockhill, Director, Washington, D.C., 1900. 2 *Maps. Presented by the Bureau of the American Republics.*

These are two maps of Mexico on the same scale, one showing, in addition to the ordinary topographical features, the location of minerals by red letters, the extent to which the rivers are navigable, railways and telegraphs; whilst the other shows the orographical features by six different colours, indicating elevations from sea-level to 3000 metres. Superimposed upon these colours are eleven symbols showing the various agricultural products of the county. The maps are rather rough productions, and the latter one is, in parts, somewhat confused. The different colours used to represent the elevations of the land are not very satisfactory, and the result and general effect would doubtless have been better if different tints of one colour had been employed for the purpose.

GENERAL

Ancient Geography. **Kiepert.**

Formæ Orbis Antiqui. 36 Karten im Format von 52 : 64 cm. mit kritischem Text und Quellenangabe zu jeder Karte. No. xix. Italia Inferior cum Insulis. Mit 5 Seiten Text. Ergänzt und herausgegeben von Richard Kiepert. Berlin: D. Reimer (Ernst Vohsen), 1901. *Price* 3 *marks.*

The late Dr. Richard Kiepert had during the lifetime of his father, Dr. Heinrich Kiepert, planned the publication of the present edition of this atlas, and in the year 1894, there appeared the first part, containing six maps. Since that date the work has been unavoidably suspended owing to the illness and lamented death of Dr. Richard Kiepert, and to the difficulty of finding a suitable person to take his place. The atlas

will now be issued in single sheets, with text, which latter will for the future be in German only. In consequence of the cost of production, the price of each sheet has been raised to three marks, which sum will now also be charged for each of the six sheets that were published in the first part of the work in 1894.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, March and April, 1901. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
1451	m = 2·5	Scotland, east coast:—Inverness firth and Beanly basin. 2*s*. 6*d*.
243	m = 4·0	Egypt, north coast:—Port of Alexandria. 2*s*. 6*d*.
3170 to 3176	d = 1·6	Antarctic ocean. 7 sheets. 2*s*. 6*d*. each sheet.
3201	m = 5·0	Iceland:—Reykjavik harbour. 1*s*. 6*d*.
3144	m = 1·0	Newfoundland:—White bay (southern portion). 1*s*. 6*d*.
3014	m = 0·8	Lake Huron:—Great Duck island to Détour passage. 2*s*. 6*d*.
1791	m = 0·8	Lake Huron:—Cove island to Great Duck island. 2*s*. 6*d*.
605	m = 0·5	Mosquito coast:—Blewfield bluff to Man-of-War cays. 2*s*. 6*d*.
573	m = 12·0	British Columbia:—Nanaimo harbour. 2*s*.
1915	m = var.	Anchorages in Alaska:—Mist harbour, Lazy bay, Sandy cove, Albatross anchorage, Isanotski strait. 1*s*. 6*d*.
638	m = {1·0, 4·0}	Africa, west coast:—River Congo and adjacent creeks, Banana creek. 2*s*. 6*d*.
2991	m = 3·0	Africa, west coast:—River Congo, Kissanga to Camoens point. 2*s*. 6*d*.
1003	m = {2·0, 0·85}	Africa, east coast:—Beira harbour, Pungue river. 2*s*.
2871	m = 2·9	Madagascar:—Nosi Bé, southern anchorages. 2*s*. 6*d*.
900	m = 0·5	Celebes, east coast:—Tilamuta harbour to Tanjong Tuladenggi. 2*s*. 6*d*.
2292	m = 2·0	China, east coast:—Sam sa inlet (southern portion). 2*s*. 6*d*.
1395	m = 3·9	China, east coast:—Tinghai and approaches. 1*s*. 6*d*.
1679		Harbours and anchorages in the archipelago:—New plan, Deuthero cove.
2208		Dniestr estuary:—Plan added, Tsarigrad mouth.
2221		Ports on the north shore of the Black sea:—Plans added, Sochi road, Khosta road.
289		Newfoundland:—New plan, Petit-pas cove.
2194		Anchorages in the northern part of Celebes:—New plan, Amurang bay.
2975		Anchorages in the west coast of Yezo island:—New plan, Iwanai anchorage.
656		Solomon islands:—Plan added, Bambataui.
986		Vanikoro islands:—Plan added, Basilisk harbour.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
3014.	St. Mary's Pool.		
1451.	Firth of Inverness.	New plan. Inverness Firth	1451
243.	Port of Alexandria.	New plan. Port of Alexandria	243
573.	Nanaimo harbour.	New plan. Nanaimo harbour	573
1915.	Anchorages in Alaska.	New sheet. Anchorages in Alaska	1915
638.	River Congo and adjacent creeks.	New plan. River Congo and adjacent creeks	638
1003.	Pungue river.	New sheet. Beira harbour, Pungue river	1003
706.	Plan of Nosi Bé, southern anchorage on this sheet.	New plan. Nosi Bé, southern anchorages	2871
2194.	Plan of Dondo point to Cape Besar on this sheet.		

No.		Cancelled by	No.
1395. Ting-hai harbour.		New plan. Ting-hai and approaches	1395
17. Plan of Basilisk harbour on this chart.		New plan. Basilisk harbour	980

Charts that have received Important Corrections.

No. 2006, Scotland, west coast:—River Clyde from Greenock to Dumbarton. 2495, Ireland:—Kenmare river. 2297, Gulf of Bothnia:—Hango head to South Quarken. 1130, Sardinia:—Cagliari bay. 2774, Adriatic:—Grossa island to Zirona channel. 2712, Adriatic:—Zirona channel to Curzola. 1238, South Shetland and South Orkney islands. 284, Newfoundland:—Cowhead harbour to Ste. Genevieve bay. 2864, United States, east coast:—Beaufort harbour. 478, Puerto Rico:—Port San Juan, 546, Brazil:—Espiritu Santo bay. 585, British Columbia:—Harbours in the strait of Georgia. 7, Arabia:—Aden and adjacent bays. 745, India, west coast:—Alvagudda to Mulki. 1009, Malacca strait:—Approaches to Perak river. 775, Cochin China:—Approaches to Haifong. 1169, Cochin China:—Approaches to port Courbet. 2376, Harbours in Formosa. 1115, China, Yang tse kiang:—Yo chau fu to Kwei chau fu. 1256, China:—Gulfs of Pe chili and Liau tung. 2357, China:—Ching Wang Tao road. 104, Korean archipelago, southern portion. 2815, Japan:—Nagasaki harbour. 806, Japan:—Sendai bay to Miyako bay. 93, Japan:—Akashi-no-Seto and approaches. 511, Manchuria:—Trinity bay to the Eastern Bosporus. 624, Victoria:—Hobson bay. 214, Solomon islands. 2392, Solomon islands:—New Georgia, Vella Lavella to Wana Wana. 261, Solomon islands:—New Georgia, Wana Wana to Mbulo island. 2873, Anchorages in the Solomon islands. 1469, Solomon islands:—Guadalcanar and Florida islands.

(*J. D. Potter, Agent.*)

North Atlantic Ocean and Mediterranean Sea. **Meteorological Office, London.**

Monthly Pilot Chart of the North Atlantic Ocean and Mediterranean Sea for June, 1901. Meteorological Office, London. *Price* 6*d*. *Presented by the Meteorological Office.*

Norwegian Charts. **Norges Geografiske Opmaaling.**

Specialkart over den Norske Kyst fra Smölen til Ramsöfjord og Hitteren, 1 : 50,000, 1898.—Specialkart over den Norske Kyst. Ranfjorden, 1 : 50,000, 1900.—Specialkart over den Norske Kyst. Namsenfjord, 1 : 40,000, 1900.—Norges Geografiske Opmaaling, Kristiania. *Presented by the Norges Geografiske Opmaaling.*

United States Charts. **United States Hydrographic Office.**

Pilot Charts of the North Pacific Ocean for May, and North Pacific Ocean for June, 1901. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Egypt. **Seton-Karr.**

Twenty-four photographs taken in Omdurman, two of the Atbara, and one taken in Fayum, by H. W. Seton-Karr, Esq., 1899. *Presented by H. W. Seton-Karr, Esq.*

Although not very good specimens of photography, some of the subjects are interesting, as will be seen by the titles.

Omdurman.—(1) Street arab; (2) Dervish Jesuits; (3) Officers, 9th Sudanese; (4) Orphan boy; (5) Inspection of kit; (6) Horse of *Times* correspondent; (6) Bugler boy, 9th Sudanese; (8) Officers, 9th Sudanese, and gazelles; (9) The Khalifa's house as it appeared after the battle of Omdurman; (10) The Nile; (11) Soldiers' quarters; (12) A guard; (13) Monument to Herbert Howard; (14) Officers of 9th Sudanese and gazelle; (15) Messrs. Seton-Karr and Nathan; (16) Mr. Seton-Karr; (17) Officers' quarters; (18, 19) Street arabs; (20) Mr. Seton-Karr at gate of Mahdi's tomb; (21) Mr. Seton-Karr on the ruins of the Mahdi's tomb; (22) Egyptian soldiers, Omdurman; (23) Mr. Seton-Karr and horse of *Times* correspondent (Mr. Humphrey W[illegible]) ——; (24) Fishing on the Atbara; (25) Camp on the Atbara; (26) Camp in Fayum.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

The

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CENTRAL KURDISTAN.*

By Major F. R. MAUNSELL, R.A.

The outline of the geographical features of Eastern Turkey is well known, and the highlands of Kurdistan and the plateau round the great Lake of Van have been described by many travellers.† I propose, therefore, to take a section of the mountain districts south of the lake, not so well explored, but interesting from its strikingly varied mountain scenery.

Kurdistan is but a geographical expression for the country inhabited principally by Kurds, and is spread over several administrative provinces of the Turkish empire, ranging along the Persian frontier up to the Trans-Caucasus and west to the borders of Asia Minor. The Kurds are essentially a race of mountaineers; they leave the Mesopotamian plain to the Arabs, and their country commences with the first outliers of the hills rising from the edge of the Tigris basin.

Central Kurdistan consists of the mountainous districts round the headwaters of the Bohtan and the Great Zab, two of the largest of the Tigris tributaries; the former is sometimes called the Eastern Tigris, and at its junction is little inferior in volume to the main stream, while the latter is the largest affluent that the Tigris receives throughout its course. The lake or inland sea of Van has itself no outlet, and is pent up along its southern shores by a series of lofty ranges extending from the Persian frontier many miles to the westward. South of these ranges the dreary outline of treeless brown hills, varied only by

* Read at the Royal Geographical Society, April 29, 1901. Map, p. 248.

† Lake Van is about 5260 feet above sea-level. It has a periodic rise and fall of about 8 feet, lasting five years each movement. Its water is bitter and undrinkable containing chiefly carbonate and sulphate of soda.

the rugged summit of some extinct volcano, which constitutes the scenery of the Van plateau, gives place to lofty mountain ranges and deep wooded valleys draining westward into the main stream of the Bohtan. Farther south a continuous range of high rounded hills divides this from the Great Zab basin, where the scenery becomes still grander, comprising lofty Alpine ranges, rocky gorges, and wooded cliffs.

The hills south of Lake Van are not a continuous range, but are divided up by various streams which rise north of the general line of the watershed, and then force their way back through the main ranges towards the Tigris instead of to the lake. The principal mass lies in the centre of the south shore, the Agherov Dagh, rising generally to 11,000 feet. It is snow-capped except for a few months in the year, and rises with but little margin from the shore, forming a fine background, enhancing the setting of the lake, and redeeming the dreariness of the northern shore. Over the eastern corner of the lake the range culminates in the Ardost peak, with steep rocky slopes overlooking the fertile valley of Vostan with its celebrated orchards and perennial streams.

East of Ardost the continuity of the range is sharply broken by the valley of the Shattakh stream and other tributaries of the Bohtan, rising among a mass of lower hills quite denuded of vegetation now, and with a surface mainly composed of sheets of rock. A curious isolated peak rising to 11,500 feet, the Bashit Dagh, then appears towering above the others, and having on its summit the tomb of a celebrated Kurdish sheikh, to which pilgrimages are annually made and sheep sacrificed. A low irregular line of hills connects Bashit with the watershed dividing from the Great Zab, and completes the circle round the headwaters of the Bohtan, which are formed by the many streams of the upland basin of Nurduz converging to one point a little north of Merwanen, below which they enter a succession of deep gorges.

The range dividing the Bohtan from the Zab presents a continuous line of great rounded hills for a considerable distance, beginning at the Persian frontier. These summits with their many springs and streams, taken together with the Nurduz basin, form an unrivalled pasture-ground for the numerous flocks of the neighbouring Kurds, nomad or sedentary. The long winter is very severe, and although some villages exist in Nurduz and a little cultivation is carried on, its chief wealth is in its pasturages, which can only be occupied in June, when the snow is melting and the young grass has come up. The Chukh pass on the Van-Bashkala road crosses at 9500 feet, and some of the summits west of it rise to 12,100 feet, while a more prominent peak south of Merwanen, the Kokobulend, to probably 13,500 feet. There is no general name for the whole range, but each rounded summit or minor peak has some local name given it by the tribe who pasture their flocks near by; usually

such names have a pastoral origin, as Av-i-Berkhan, "the water for lambs;" Givri Chevrosk, "the hare's ear;" Dola Beranan, "the little goat's leap;" and so on.

A remarkable feature are the "yailas," or small upland plains shut in among the higher summits, often giving 3 or 4 miles of level grassy pasture, watered by springs and streams of icy-cold water, which disappear into deeper valleys in the lower slopes. The Tuzek and Nebinov yailas are near Merwanen, and a little to the south-west is the specially remarkable "yaila" of Farashin, "the joyful pleasant place," the largest of all, in which are the headwaters of the Khabur, a tributary of the Tigris. From about the middle of June to the end of September these

KURDISH TENT ON A "YAILA" IN NURDUZ.

yailas and pasturages are occupied by the various tribes, each having its area carefully delimited, which it occupies year after year, often after much discussion and possible bloodshed. Roughly speaking, it appears that the strongest man with the most sheep generally manages to appropriate the best pasturage. The scene in early June as the tribes begin to arrive is one of much animation and beauty. Great drifts of snow still lie about, and almost before they have completely melted, a perfect carpet of varied flowers comes springing out of the ground; among others the alpine gentian, various kinds of tulip, ranunculus, iris, and such old friends as the English primrose and cowslip are to be seen. These, with the vivid green of the young grass, the brilliant sunshine,

and bustling animation of pitching the tents and camp life generally, make a brilliant scene typical of Kurdish life.

Practically, the whole of the tribes occupying Nurduz and Farashin are comprised in the great group of Hartoshi Kurds, divided into twelve subsections, most of whom live in villages in the winter. But there is an important nomad portion under Hajji Beg, the most powerful chief, who occupy Farashin in the summer, and migrate to the Tigris plains near Zakho in the winter; these are true nomads, always living in their tents.

At the higher elevations on the Van plateau, the tribes find the distance too great to migrate to the Tigris valley, and spend the winter in villages. These are generally a collection of half-underground mud hovels, which are really looked on as a temporary resting-place until the season becomes more favourable, and tent-life, the true life of the nomad, can be resumed. The Kurd is seen at his best in tents, tending his flocks and engaging in a pastoral life, always ready to dispense hospitality with an open hand and welcome the stranger with a bowl of "airan," the thick curdled milk mixed with water which forms their staple drink. Many of the villages on the Van plateau and in Nurduz are completely deserted in summer for tents; the few household effects are readily removed, the door is left swung open, and the house takes care of itself. A few men may be found left to tend any patches of cultivation and gardens close by, but otherwise not a soul is to be seen.

The wide basin enclosing the pasture-lands of Nurduz has a gateway to the westward, with a lofty range on either hand like pillars guarding the narrow opening. A spur from the Agherov Dagh runs south until over the river gorge near Shattakh, and there terminates in the rocky mass of Arnost mountain; this, with a long flat-topped ridge known as the Maidan Tash, both rising to about 11,000 feet above sea-level, with very abrupt rocky slopes, overhangs the little town and villages of Shattakh. The other pillar, across the valley, is formed by a long spur of the Zab range jutting out south of Merwanen and terminating in the Gilolokan mountain, which towers over Shattakh from the south, and is also quite 11,000 feet above sea-level. Shattakh itself, by the river-bank, is but 4900 feet, so that the huge dimensions of this gap, 5000 feet deep and 9½ miles across, can be realized.

Owing to their confined situation at the foot of such steep slopes, the numerous small villages clustering round Shattakh as a centre suffer a good deal from destructive avalanches, which have been known to bury an entire village. About the centre of the Nurduz basin the river makes a sharp bend to the north-east, entering a series of deep rocky gorges with slopes well wooded with oaks, and here and there small villages with terraced cultivation on some favourable part of the

hillside. In this gorge, also, is the celebrated Armenian monastery of Hokotzvank, which contains the tomb of Tiridates. Shattakh village is at the junction of a fine stream, coming down a wooded valley from the north, which affords easy access to the Van plain. Like many of these streams, this has its origin in a huge spring which gushes out of the rock and is known as the Kani-spi, or white spring. The Bohtan itself and this stream swarm with fine trout, which are usually caught at night by a couple of men, one holding a torch to attract the fish, and the other wading about with a barbed spear ready to impale the fish when he sees them.

Around Shattakh the valleys first become wooded, junipers being

PASS LEADING DOWN INTO SHATTAKH.

found first on the slopes from 6500 to 7500 feet elevation, below which all the lower levels are thickly covered with oaks, which may be called the national tree of Kurdistan. In the districts within easy reach of the Van plateau trees have been ruthlessly exterminated for firewood, in many cases dug up roots and all; while throughout the country trees are stunted from the prevalent custom of cutting the small branches with their leaves in autumn and storing them as winter fodder for sheep and cattle. In the valleys the most striking tree is the walnut, which gives a welcome green effect to the predominating tints of grey rock or brown hills. Sycamore and ash are found by the streams. On all the upland pastures of the country the slopes are

covered with low shrubs of gum tragacanth, or "gavvan," growing about 18 inches high, which burn very readily if a light be applied, and are generally used for kindling. The gum is never extracted in this part of the country, but is so in South-West Persia. Wild rhubarb plant exists in considerable quantities on these hills also, and is brought into Van for sale in the early summer.

Grey bears and the wild pig, especially the latter, are to be found in fair numbers in the Shattakh valleys, and do much damage to the crops at night. The lynx is also found in the deeper and wilder gorges, but is very rare. On the open uplands round Nurduz the wild sheep and moufflon are found in considerable numbers, and the ibex, or wild goat, on the crags and cliffs. The stone marten and tree marten are to be found, and are much sought after for their skins; also a grey squirrel is very common in these Bohtan forests. In addition to the red-legged and grey partridge, which are found in extraordinary numbers on these slopes, is the giant partridge, or "Ur Keklik," which is rather larger than a blackcock, and is generally in pairs or single, found at elevations not less than 8500 or 9000 feet.

The Shattakh gorge continues for some miles below the village, and affords some strikingly grand cliff scenery, the left bank especially showing sheer masses of rock forming spurs of Gilolokan; while on the right, high up the slope, watered by plentiful springs, is the large Armenian village of Gachit and some others, each with a rich patch of garden and orchards, with wheat and millet on small terraces on the steep slope. The gorge opens near the small village of Khumara; but only on the left bank do the hills recede and the country become more open, while on the far bank rises a huge wall of grey limestone for quite 2000 feet, supporting the southern slopes of the Arnost mountain. The rough summits of the Agherov range and Arnost afford in places grazing for the flocks of numerous sections of the Miran nomad Kurds.

A little above Khumara, on the left bank, the Yezdinan stream joins from the upland pastures of Kavalis district, similar to Nurduz, but smaller, and on the other slope of the Gilolokan range; the lower course of this stream is through a remarkable gorge bordered by huge walls of rock, and sheltering a few villages of Alan Kurds, a section of the Hartoshi. On a splendid crag which overhangs the junction of the streams are to be found the traces of an old castle known as the Kelli-Ziril, said to be of great antiquity, and from the peculiar rock scarping, like that of Van citadel, was probably an outpost guarding the approach to the lake plateau in the Chaldean times when Van was a capital city.

Below Khumara the river valley is strikingly beautiful, having on one side even wooded slopes and occasional rocky ravines, with a few villages of Hawishtan Kurds among the trees, in the centre the

foaming torrent of the Bohtan tumbling over boulders, and on the other side the steep buttresses of Arnost, with a few Armenian villages, each in a dark green patch of gardens and cultivation, halfway up the nearly inaccessible slope. A few miles further down on the left bank, a large tributary called the Masiro, or "river of fishes," joins from the high uplands forming the watershed with the Great Zab. A wide gap occurs here in the ranges following the left bank of the Bohtan, and on its far side abruptly rises the stony flat-topped mass of Harakol

IBRAHIM BEY, CHIEF OF TAKURI KURDS.

Dagh, terminating in an enormous crag at its south-eastern corner. Curiously enough, the Masiro does not come through this gap, but instead has carved for itself a very deep gorge through the main ridge, cutting a fragment from it in the shape of a remarkable flat-topped mountain called Awrakh, whose summit is ringed round with cliffs, and only accessible by a rugged path on the south. The end of the range from which this has been severed is a great wall of cliffs, with oaks and junipers clinging wherever they can get foothold. This

gorge is known as the Tang-i-Balian, and affords some splendid cliff scenery. On the many pasture lands round here are to be found in summer the tents of the various sections of the Miran tribe of nomads under Mustapha Pasha, who has great wealth of flocks, and goes for the winter to the Tigris plain about Jezire. In point of numbers, they come next after the Hartoshi among the large nomad tribes of this part of the country.

In recent years both these tribes, at least the nomad portion, have discarded the distinctive Kurdish dress of a short jacket of thick goats' hair, a black and red turban, with gay waistcoats and flowing sleeves, and have taken to the Arab headdress, with handkerchief kept in place by looped strands of camel-hair, and flowing robes like the Bedouin. This is by no means an improvement, and when I saw Hajji Beg, the Hartoshi chief, in his tents in Nurduz, he was attired in a black Stambuli frock coat.

Beyond the gap dominated by Harakol, separated only by a low col, a wide basin opens, draining south-east by the various tributaries of the Hazil river, which spread out fanlike between narrow shale spurs covered with oak forest and converging towards the mouth of some fine gorges, through which the stream passes to join the Khabur near Zakho. This curious district is entirely uninhabited, except when the nomads pass through in their migrations, and a few Kurds gathering oak-galls. The Bohtan now enters another deep pathless gorge, the Ghelli-Herin, and then the hills trend back, and the valley becomes more open, although the river keeps in a deep ravine sunk below the general level of the open country. This is the district of Bohtan, or Bohtan Berwari, and is among the most fertile and productive parts of Kurdistan. This zone is sufficiently elevated to escape the great heat of the middle Tigris basin, is watered by countless springs and streams, and is yet sufficiently warm to produce rice, cotton, figs, and pomegranates, and a great variety of fruits. The extreme severity of the winter on the upland plateau is here avoided, and the half-underground hovels of that region give place here to a better style of house, usually two-storied, with wooden verandah. The Kurds are here divided into a number of small sections, each under its own bey, and are not nomad.

A large northern tributary joins from the district of Mukus, which is separated from Lake Van by the main Agherov range, and shut in on either hand by lofty spurs from it. The Mukus stream has its origin above the village in the Bash Bulak, a splendid spring of clear cold water (mentioned by Layard), which has a great volume in the early summer, but becomes much reduced in the autumn. The local idea that it is an outlet of Lake Van is obviously wrong, as the barometer shows it at a much higher level. Mukus, or Meuks (Armenian), is a compact district with many Kurd and Christian villages in seven smaller valleys

radiating from the main one, and was the ancient Roman province of Moxene, which name is still preserved in its present title.

One of the hills overlooking Bohtan Berwari from the south bears the Kurdish name of Nuh-i-Giran, or descent of Noah, and a tradition points to it as the resting-place of the Ark, the fertile valley of the Bohtan at its base being the first country entered. It may be as well to note, in connection with this, that not far to the south, overlooking Jezire on the Tigris, is the Jebel Judi, or Jew's mountain, to which Mohammedan tradition points as being the veritable resting-place of the Ark also. There are no historical remains in these districts in the shape of cuneiform inscriptions, and the Kelli Ziril, near Khumara, mentioned above, is

VILLAGE OF MUKUS.

the only probable remnant of the Vannic period. But in Nurduz are numerous examples of the remains of some historic race which occupied that country, in the shape of stone forts built of immense rocks roughly shaped and joined without mortar, which must have taken considerable skill and labour to place in position, and must be more than the work of mere shepherds. Most of them in Nurduz are now nearly level with the ground, but I was fortunate in obtaining a photograph of one near Elk, in the Khabur valley, which has seven tiers of great blocks, and the building is roughly 12 yards square, with no trace of door or windows now to be found. These forts were placed commanding all the principal passes into the upland pastures, and some were on the

"yailas" themselves. Their use was apparently to defend the pastures and flocks against raiding-parties of some foes, as doubtless these uplands have for many ages been used for little else than a summer grazing-ground. The only modern Kurdish idea I could determine was that the forts were built by a race of giants, who handled these stones like pebbles, and were finally brought into subjection by Solomon the Great. There are also in the tea-room a few flint, or rather obsidian, implements and fragments of pottery of a very ancient date, prior even to the Chaldean times, found in a tumulus near Van by the expedition of Dr. Belck and Lehmann in 1898.

Passing to the other side of the main watershed, into the upper basin of the Great Zab, the scenery becomes much bolder and more striking; the high rounded summits, with their "yailas," give place to splendid rocky pinnacles, and the Zab valley is a deep gorge of striking grandeur, joined by others scarcely less beautiful from the ranges on either hand. What is perhaps most striking is the extraordinary depth of the river gorge between the lofty summits on either side, and in a day's journey the actual horizontal distance is only a few miles after almost as much climbing of perpendicular slopes or stair-like paths.

The Zab rises in an uneventful way among the low hills along the Persian frontier, close to the point where the Chukh Dagh merges in the frontier hills; its earlier course is down the broad valley of Albak among open meadows, passing the small town and seat of government at Bashkala, at the foot of the hills to the north. A few miles below this the valley quickly narrows, and the first of a long series of tortuous gorges is entered, from which the river never manages to escape even for a brief moment, until but a comparatively short distance before its junction with the Tigris; it is always a mountain torrent pent up between rocky walls, with little room even for rough bridle-paths along its banks. South of Bashkala, along the frontier ranges, the country is fairly open, and contains the curious plain of Gavar, 25 miles long and 5 broad, which lies close under the Jelu ranges to the east, and from its formation appears to have been once a lake. The southern end is now a reedy lake, fed by some fine springs, and the whole plain usually becomes flooded on the melting of the snows and during the autumn rains. The centre of the plain is occupied by several Nestorian villages, which cultivate the fertile soil, and round the edges are many Kurdish villages of the Doshki, Heriki, Biliji, and Deri section of the Hartoshi, whose interests are chiefly pastoral. The plain level is 6500 feet above the sea, with an extremely severe winter climate, and is drained by the Nihail stream, a tributary of the Zab, which it joins soon after it enters the main gorges. To the south, just below the junction of this stream, with scarcely any transition stage in the shape of minor outliers, rises the great mass of the Jelu mountains, with a summit line of splendid crags and pinnacles,

which show up even bolder and loftier when contrasted with the rounded contours of the hills to the north, and by the isolation of the general mass towering far above the frontier hills.

The hills to the north above Nurduz and Bashkala are very deceptive as regards their height, as they are without prominent peaks that catch the eye, and it was rather a surprise when the boiling-point thermometer gave the height of the Tozo summit above Bashkala as 12,100, while some rocky crags of the Welitan mountain near by were 1000 feet higher, or 13,100. The main gorge of the Zab is too narrow and precipitous to contain many villages, and consequently the inhabited districts are in the several valleys joining the main stream in succession

KOCHANNES, RESIDENCE OF MAR SHIMUN, THE NESTORIAN PATRIARCH.

at right angles. At first most of these are on the right bank of the main stream, the first below Bashkala being the Kurdish valley of Shivelan, draining the Harifta mountain, which rises to about 11,500 or 12,000 feet, and is a southern offshoot from the main watershed. The valleys now become much deeper and narrower, with precipitous sides, on which a few oaks may be found; and draining the west slopes of Harifta is the Berwari valley, with six villages of Nestorian Christians. Below this is the valley of Kochannes, draining the wide upland pasturage of Berchilan, over which towers the rocky cluster of peaks forming the summit of Kokobulend,* the culminating point of all the

* This peak seems undoubtedly the same as that called Karnessa-ou-Daoleh by

watershed range. The village of Kochannes is interesting as the residence of Mar Shimun, the patriarch of the Nestorian Christians.

A few miles lower, and separated by a broad col, in which are the two prominent rocky peaks of Chaila and Berichaila, comes the valley of Julamerk, with broad easy slopes at its upper end, with many streams irrigating ricefields and finding a narrow rocky exit at its lower end into the rift of the Zab valley. Julamerk was formerly the residence of the Mir or chieftain of Hakkiari, which is the general name for all these mountain districts bordering the Zab. The place is now the centre of Turkish government, and the few remains of an old castle on a prominent crag overlooking the village are all that reminds one of the old Kurdish rulers.

Nearly opposite the mouth of the Kochannes valley is that of Des on the left bank, to be described later, and opposite Julamerk the rocky gorges of Uri, Erik, and Kiyu, too precipitous to afford room for any habitations except a small village in the last named. Leaving Julamerk, the Zab makes a wide bend to the west, and passing over a broad col in some southern outliers of Kokobulend, the small Kurdish valley of Selai is entered, which drains through a deep rift into the main stream, but whose upper basin has some pretty villages among walnut trees and terraces of cultivation. Across the deep river-gorge is the mouth of the large valley of Tal, with several Christian villages, up which a track leads to Amadia, shorter than that following the western bend of the river. Bending somewhat to the north the wide upland basin of Lewin is entered, with several minor valleys, and supplying the largest tributary of the Zab on this bank. The hill formation remains the same throughout in these valleys, the upper basin of rolling hills sometimes steep, of shale formations with little rock showing, and with a countless number of springs and streams. Nearer the Zab, overhanging the river itself, hard rocky formations abruptly supervene, and the scenery quickly changes to wild crags and gorges, giving a far more striking effect. The upper part of Lewin is thus a very pleasant upland, with many Kurd and Christian villages with orchards and gardens. Lower down the stream enters a fine gorge leading into the main stream.

Below Lewin, on the right bank, are the valleys of Upper and Lower Tiari, and on the left bank the long valley of Salebekkan and Tkhuma, which complete all the districts of the Nestorian Christians. At the head of Lewin valley the main watershed becomes parted in a curious way in the centre by the Farashin upland, in which the Khabur, a large tributary of the Tigris, rises. This stream, formed by many springs and rills in Farashin, soon enters a deep narrow gorge, well

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Layard. The name Koko Bulend is given by the people on its southern slope, the Kurdish nomads on the other side probably having other names for it (Layard's 'Nineveh and Babylon' (1853), p. 422).

wooded, with some splendid crag scenery on its border slopes. The valley is first occupied by the villages of the Gavdan and Mamkhoran Kurds, and further down, round Elk and Beit-es-Shebab, by the Zshiriki. The most remarkable feature in these ranges is an immense wall of rock which commences in the Awrakh Dagh overlooking the Bohtan valley, continues south-east, bordering the basin of Hazil, and finally crossing over into the Khabur valley near Elk. It is known as the Dahazir ridge, and although at first there are broken places where the rock has fallen away and passages lead through, yet on the crest overlooking Elk, it is a perfectly unbroken wall several hundred feet high, facing out to

GROUP OF NESTORIAN CHRISTIANS.

the south-west, with a summit line nearly straight. The Khabur forces its way through this line, but on the far bank the ridge, still a straight wall of grey rock, soon attains the same elevation, and continues over into a tributary valley of Lewin, where it ends rather abruptly, although traces of the same formation exist, connecting up across the Zab with Jelu mountains. The crest line between the Khabur and the Zab attains to an elevation of about 10,500 feet, and only a single pathway leads across it by what is called the Deria-i-Zir, or Golden Gate, a name given also to the whole ridge, not from the existence of any precious metal, but from the fact that in former times a powerful chief held up any parties of nomads or caravans passing through, and made them pay a golden toll.

Turning now to the left bank of the Zab, there is first the Jelu Dagh, overlooking Gavar plain and the Zab valley. The general name given by the Turks to the whole range is the Jelu Dagh, but the various peaks and crags have local names, which require care to identify, as Kurd and Christian have each their own names, and it was only after making a complete circuit of the range and asking many guides that the final names could be determined. At the eastern end of the main range is Galianu, a long ridge of friable rock and shale of very steep contour, but possible of ascent after a difficult climb. The boiling-point thermometer gave the summit as 12,115 feet, and the view was superb to the south-west over rugged crags and gorges, in which the middle course of the Zab could be traced, and beyond, just visible in the haze, the commencement of the Mesopotamian plain.

To the south across a deep wide chasm was the rocky line, streaked with snow, of the summits of the Sat Dagh, which rise slightly higher than Jelu itself; and eastward the Gavar and Bashkala plains with the frontier hills were spread out to view. There is a small isolated peak at the extreme end of the ridge, on the summit of which was said to be a cuneiform inscription; but the rock is very friable, and if there ever was one there, it has now become worn away. At the extreme summit of the pinnacle, reached by some steep steps and holes cut in the rock, are the remains of a building, partly cut out of the rock and only a few feet square, which might have been a hermit's cell, but most probably was a watch-tower to give alarm of possible enemies from Gavar. The Nestorians claim it as the summer residence of Balak, their national hero of pre-Mohammedan days, who is said to have stabled his horses either on the rocky pinnacle or on the steep slope beside, which is a manifest impossibility. A rocky col severs Galianu from the main group, the central figure of which is the sharp peak of Geliashin, or the Blue cliff in Kurdish, which may be also identified as the Tura Shina of Layard, Shina in Syriac meaning "a cliff," and the name "the mountain of the cliff." Another Syriac name is Tura Khwara, or the White mountain. On all sides, except a narrow ridge on the south-east, are sheer precipices of several hundred feet, and after three attempts, in each of which I was brought up against lines of huge cliffs, I finally discovered that a steep path to the summit existed on the south-east side, but it was too late then to attempt it. The only guides procurable were very misleading, making any statement, if they thought it would please, and were very difficult to verify. The summit ridges swarm with ibex and moufflon, and many of the giant partridge were also seen. Judging from Galianu, the summit of Geliashin must be at least 1500 feet higher, or 13,500 feet above sea-level.

From Geliashin a razor-edged ridge of limestone rock runs nearly due west for a few miles, and terminates in a very sharp-pointed peak known as the Suppa Durek, or Lady's Finger (mentioned by Layard),

a prominent landmark in the confused outline of crag and pinnacle west of Geliashin. A col which gives access by a stair-like path from the Zab valley into Jelu district now intervenes to the west, beyond which runs a rugged watershed range of lesser elevation, but containing the sharp peak of Khisara, quite inaccessible except by the wild goats, and enclosing the rocky gorges of Kiyu and Uri draining to the Zab, and overlooking Jelu and Baz to the south.

A little south of the main ridge of Geliashin, and forming part of the group, are two masses of rock, one the Tura Dauil (David's mountain), and facing it across a deep chasm-like valley, the other called Nakhira Shirka, both rising to about 11,000 feet. The north slopes of

MAIN JELU RANGE FROM THE N.W., SHOWING GELIASHIN PEAK IN THE CENTRE, AND SUPPA DUREK ON THE RIGHT.

Geliashin and Suppa Durek are perhaps the grandest, as the ground falls away in a splendid succession of crags and precipices into the head of the valley of Des or Deezan, and the stream-level of the Great Zab, only 12 miles off, but 9270 feet lower.

Below the crest a small glacier nestles under Geliashin on the north, giving rise to the Des stream, called in Turkish the Kar Su, or Snow water, and in Syriac, Mia Khwara, or White water. Des is the first, on the left bank of the Zab, of the Nestorian Christian valleys, each of which comprises a little community or canton by itself under its own malik, the spiritual head being the Patriarch Mar Shimun, who lives at Kochannes, in a similar valley on the far bank of the Zab nearly

opposite Des. The valley of Des, especially in its upper part, affords the most picturesque and varied crag scenery imaginable, and of its seven villages some are not visible from the track by the stream, but are perched on some favourable terrace of ground to obtain more room than the narrow chasm affords, and escape the summer heat and malaria below. A village so situated has its "chumbi" or suburb in the valley itself, consisting of a few houses and mills, with walnut trees and scanty patches of cultivation in the bends of the little stream.

The valley is not without its historical interest, as at the junction with the Zab are the ruins of a fine castle called the Mudebbir Kale, after a celebrated Mira of Hakkiari of some fifty years ago, while higher up is the Suringa Kale, a prominent crag, the scene of a protracted struggle between the inhabitants of Des and the forces of Bedar Khan Beg, a Kurdish chief of about the same period.

Quite at the head of the valley, on a rocky cliff, is the tiny church of Mar Giwergis, or Saint George, in which a service is only held once a year, on the saint's name day. On the north-eastern slopes of Geliashin are some smaller glaciers, giving rise to streams going down to Gavar; and under Galianu on that side is a large circular pool or moraine formed by ice-action.

On the south, in the cleft under Tura Dauil, is a large mass of snow, over which a precipitous path from Jelu to Gavar leads, and this is all the permanent snow remaining at the end of summer; but, seen from Gavar at the end of June, the Jelu mountains were a fine sight, with all the crags and precipices jewelled with ice-crystals, masses of snow, and huge icicles.

The south side of Jelu is drained by the Rudbar-i-Shin, a large mountain torrent which forces its way through difficult gorges in a wooded country between limestone ridges, to join the Zab below Amadia, and whose course is not unlike the Zab, in that it is joined by several lateral valleys on either hand, each forming a separate canton of its own.

Just south of the main range is the Christian district of Greater Jelu, draining down into a northern arm of the Rudbar-i-Shin, and whose principal centre is Marta Mar Zaia, or the village of a Saint Zaia. The fine crag of Tura Dauil overhangs the village, and is a limestone wall of striking appearance, distant barely 2 miles, but the summit 4500 feet above, with quite 1000 feet sheer precipice. A little only of the Geliashin ridge is visible, but sufficient to show near the top of the cliff a rectangular opening, the mouth of a cave, lighted by a curious shaft in its rocky roof, and called by these imaginative people the cradle of Mar Zaia. In the village is a fine church, in which hang some lacquered jars, votive offerings brought by Nestorian missionaries returning from China, where they ministered and made converts before the Mohammedan era; while close by are later offerings of

American clocks and other articles, presented on a safe return from a long European tour.

The inhabitants of Jelu, in distinction to those of the other valleys of Tiari and Tkhuma, are wonderful travellers, making begging tours to all parts of the world. Consequently, people talking a little English are easy to find, but it was rather disconcerting to be addressed in a strong American accent by a man who had been through the recent Spanish war as an American sailor, but who had just returned to tend

VALLEY OF DES, SHOWING SURINGA KALE.

his home farm, the sense of attachment to this little canton in a valley under Geliashin being stronger than the delights of civilization. One old fellow, who had finished his travelling days, said he knew London well, but the only name he could just then remember was Bow Street. Another was returning with a comrade from a successful tour in the Brazils, when his friend died off Lisbon, leaving £175, which was handed over to the Turkish consul at Lisbon until proof of next-of-kin relationship was established. The man was starting for Lisbon this

spring. This gives a good idea of the extraordinary way in which these people exploit the whole world in their tours.

Farther down the valley from Jelu is the district of Baz, with a group of villages surrounded by orchards and little terraces growing maize and millet, which form the principal food, wheat having to be imported from Gavar. These are an industrious people, quite different from the jovial beggars of Mar Zaia, and are famous for their skill in carpentering and working iron, to carry on which they go to Mosul and other large towns.

West of Baz is the little basin of Tovi, containing a Kurd village of that name; and beyond rises a fine mountain, the Ghara Dagh, or Ghara de Bazin, with precipitous sides, but open rounded summit, used as summer pastures, or "zoma," by the people of Baz, and also those of the Christian districts of Tkhuma and Salebekkan, draining down to the Zab on the far side of the mountain. South of the Jelu ranges, but separated from them by a wide deep gap, is the Sat Dagh, or Ser-i-Sati in Kurdish, not quite so striking in its lonely grandeur as Geliashin, but rising somewhat higher to about 14,000 or 14,500 feet, as far as I could estimate from Galianu, the summit being a line of rugged pinnacles and crags, rather higher at its western end. On the upper part of its northern slope could be traced some level pasture grounds, used by the Heriki Kurds, with abundant patches of snow between the crags late in autumn. To the north-west are thrown out some spurs of bare rock, which terminate over the valley of the Rudbar-i-Shin and the Kurd village of Oramar in some stupendous cliffs, which are just masses of greyish white rock without any relieving touches in their whole extent except the black shadows of the gorge of the Rudbar-i-Shin and its tributaries. A little oasis in this grey desert is formed by the orchards and gardens of Oramar, perched on a fertile terrace overlooking the gorge below, the centre of a Kurdish tribe of the same name, and famous for its grapes, which are a large white variety of oval shape, and fully equal to their reputation. Figs and pomegranates are also grown, and testify to the mildness of the climate. The Heriki are a large tribe with seven sections, some purely nomad, and others sedentary.

The nomads occupy part of the Persian frontier hills and the Sat Dagh in summer, and go down to the Mosul plain for the winter, crossing the Zab near Zebar. The chiefs usually have tents, but many other members of the tribe make booths of oak boughs at each halting-place, all the country down to the edge of the plain being well wooded with oaks and affording the necessary shelter. Their whole worldly goods consists of their horse, some sheep and goats, a few cooking-pots, and the inevitable Martini and belt of cartridges. The sedentary portion live in villages in three deep, almost inaccessible gorges on the south side of Sat Dagh, the general name of the district being also

Heriki. A branch of the Rudbar-i-Shin rises on the north side of Sati, and winds round through the gorges separating it from Jelu, and in the lower part of which is the Christian district of Ishtazin, and higher up on more rounded slopes the Kurdish district of Bashtazin. Some idea of the bold contour of the country and the depth of the Ishtazin gorge may be gathered from the fact that Galianu towers nearly 9000 feet above the stream-level at the lower end of the gorge, and is but 6 miles distant from it. The path leading from Jelu to Ishtazin enters the main gorge through a rift barely 8 feet wide, with perpendicular walls of rock. The Ishtazin villages, with their orchards and gardens, are situated on some spurs less rocky than further downstream, and

VALLEY BELOW SHEMSDINAN, TYPICAL OF COUNTRY THERE.

provide a welcome note of green contrasting with grey rocks towering on either hand. Below Oramar on the left bank a large stream joins from the western side of the Sat Dagh, up whose valley are the large villages of Sati and Deh, partly Kurd and partly Nestorian, the whole of this side of Sat Dagh overlooking the valley being a huge wall of rock nearly 6 miles long.

The Rudbar-i-Shin finally joins the Zab through a remarkable chasm called the Tang-i-Balinda, 3 miles long, through which not even a foot-track can be followed, although it is possible to scramble along the steep slope overlooking it. It here receives a large tributary from the north, rising in the Tkhuma hills, and called the Yahudi Chai, or

Jew's river, in which are the secluded mountain districts of Nervi and Reikan. As the name implies, besides the Kurds are many Jews among the inhabitants, probably a section of the fairly numerous Jewish population who live in villages round Akra and Begil to the south beyond the Zab. They have been here for centuries, and appear to be refugees from the ancient Nineveh (the modern Mosul), and, if their history could be traced, would be found quite as interesting as that of the Nestorians themselves. Many of them trade as small pedlars among the Kurds, and wander all about the mountain districts from Bashkala to Amadia and down to Mosul.

The Sat Dagh is an isolated mass separated from the Persian frontier hills by the lower end of the plain of Gavar and the upland valley of Khumara, and from the other ranges to the south by the deep valley of the Shemsdinan river, a tributary of the Zab formed by streams from Khumara and the Zerzan districts on the frontier. The whole district is known as Shemsdinan, with the centre of Turkish government at Neri, a large village prettily situated in a side valley off the main gorge ensconced amid walnut groves and orchards. The district is devoted to the cultivation of tobacco, which finds a ready sale in Persia, being of the variety suitable for smoking in the *kalian*, or Persian pipe. The trade is entirely in the hands of the influential Kurdish Sheik Sadik, who lives in Neri itself.

The scenery in this rocky gorge is quite in keeping with the districts just described, with the steep slopes of Sat Dagh, thickly wooded with oaks, and seamed by three rocky valleys, in which are hid the villages of the Heriki Kurds. On the south side rise the dark rocky masses of the Bash-i-Rua range, culminating in a fine peak known as Guraimiz Gavdan, the whole summit being a mass of black rocky crags and pinnacles, and the slopes almost inaccessible.

Such is a description of a portion of Central Kurdistan, fascinating in the grandeur of its wild gorges, grey cliffs, and oak-clad slopes, the home of the Kurds, the direct descendants of the Karduchii, who hurled rocks on Xenophon's troops as they forced a passage through their gorges, and whose wild secluded valleys form backwaters in which have come to rest remnants of Nestorians and Jews thrown aside by the various tides of conquest that have rolled over these historic lands.

Notes on the Geology by Mr. F. Oswald, who travelled in the Country round Lake Van with Mr. Lynch in 1898.

Unfortunately, very little is known about the geology of Central Kurdistan. Ainsworth, in the *Journal* of this Society in 1841, gave a geological section along the Zab valley from Amadia to Bashkala, and both he and Loftus described the section from Jezireh to Bitlis. Since that date hardly anything has been done to increase our geological knowledge of the region; the following general conclusions are based on these sections, on some notes of a journey between Van and Sert, on my own observations in 1898, in the Gözelderah, on the south coast of Lake Van,

and on the descriptions by Loftus and Rodler of the geology of the Zagros, the south-easterly continuation of the Taurus ranges.

Broadly speaking, Central Kurdistan may be divided into four geological zones. The northernmost zone consists of marble, mica-schists, and clay-slates, of Palæozoic, or possibly Triassic age; they occur along the south coast of Lake Van, and form the axis and watershed of the Taurus. To the south of these ancient rocks there follows a great series of grey limestones and shales of Cretaceous age, frequently containing ores of lead, iron, and copper; still further south lies a belt of massive white Tertiary limestones, partly Eocene, with Nummulites, but mainly Lower Miocene, with occasional seams of lignite, *e.g.* near Sheranis and Herbol, north of Zakho; these limestones compose the broad undulating country of the lower Bohtan river. Finally, these rocks are overlaid by Upper Miocene red sandstones, with gypsum and rock-salt, which occur near Sert and Hazo, and especially form the foothills of the Taurus and Zagros, sinking into the broad plains of Mesopotamia.

Major Clayton, in 1887, recognized the dolomitic character of the Jelu mountains; it is not improbable that these strata are of a Triassic age. Ainsworth found abundant "madreporites" in the corresponding beds on the right bank of the Zab, but unfortunately did not identify these fossils. No Jurassic rocks have been found either in the Taurus or in the Zagros, although they are well known in Azerbaijan and the eastern border ranges of Russian Armenia.

There are many instances of a varied nature of igneous or plutonic rocks in this part of the Taurus, such as the tuff-crater of Sheikh Ora, breached by the waters of Lake Van; the basalt flows in the valley of Guzel Dere and the Bitlis Chai; the zones of serpentine; the intrusions of porphyrite in the Shirvan district, where there are ancient disused gold-mines; and, finally, the granite masses of Selai and Berichaila, near Julamerk.

In this highly-mountainous country, subject to earth-movements from a very distant geological period, many great faults have occurred, but none greater than the one which marks the southern limits of the depression of Lake Van and the Plain of Mush. It is even a greater line of dislocation than the great fault separating the Grampians from the central Lowlands of Scotland. There could hardly be a more striking contrast between the high rugged peaks of ancient marbles and schists south of Lake Van, and the broad Armenian plateau to the north, consisting of Cretaceous and Tertiary strata, flooded by lavas and dominated by great volcanoes.

Before the reading of the paper, the PRESIDENT said: The paper to be read this evening by Major Maunsell is on a very interesting part of Asia, and one of which we have had no account for at least the last forty years, and many parts of which are still unknown, and that is the central part of Kurdistan and the valley of the Tigris.

After the reading of the paper, the following discussion took place:—

Earl PERCY: I have been asked to make a few remarks upon this paper to-night, but I do not know that I can contribute anything of real value, because I do not think the haphazard impressions of an ordinary traveller are worth comparing to the scientific observations of a trained explorer like Major Maunsell. But, at any rate, I think I may congratulate him on behalf of the members of this Society for the very interesting and exhaustive paper which he has read, and on the magnificent photographs with which he has illustrated the lecture. He has described, I think, almost all the main districts of the Nestorian country, as well as the upper waters of the Bohtan river and the Great Zab. I do not know much about the

upper waters of the Bohtan river, because my first meeting with Major Maunsell was later on, when I was going into the Kochannes country; but there are several points upon which I think we should like some information, if Major Maunsell would give it. He has hazarded one or two historical and archæological comments, which I think are open to doubt. For instance, he has alluded to the stone implements found in the neighbourhood of Van; but I do not know of any trustworthy argument that can be deduced from the fact of stone implements being found in that neighbourhood, because we know they were used by populations living close to a very high state of civilization. I remember, for instance, in one of the deserts in Lower Egypt, coming upon a large mound of flint instruments, which are supposed to date from a very late period, when the dwellers on the banks of the Nile were in a high state of civilization. He has also alluded to the Jews, and said they were probably refugees from the city of Nineveh. I do not know that one can make any very confident assertion on that point, but I think it is open to question whether they were not the original settlers who were transferred after the fall of Samaria. Certainly there is a very distinct statement, I think, if I remember rightly, in the Second Book of Chronicles, to the effect that many of the ancient dwellers of Samaria were transferred to the "cities of the Medes" beyond the Tigris. There is one other point upon which I should like information, but I do not know whether any traveller in that district has gone into the question—that is, the geology. Of course a great deal of that country is composed of igneous rocks, such, for instance, as the range between the valley of Tâl and the valley of Tkhuma. I do not know whether I am right in supposing that the "Jelu" peaks are of dolomite formation. I remember a book which may be familiar to many of the members of this Society by Mr. Binder, who travelled in the country in 1886, in which he describes a visit he made to the country. I think he is talking of the mountain range which goes by the name of "Chella" and "Berechella," and he asserts that on that range he found a considerable tract of apparently fossilized forest. I do not know whether Major Maunsell, in the course of his travels, ever came across any traces of that kind; certainly I never did, but it would be very interesting to discover how far that had been done. I think Major Maunsell's map will be of very great value, because I know myself, from having been twice in this neighbourhood, the extreme difficulty that I experienced in getting any map of the least value at all. The whole of the northern part of the map has been very carefully and elaborately done, and my only difficulty in looking at it for the first time was that so many of the names used by the Nestorian population are quite different from the names given on the map. There is one part of the country upon which Major Maunsell has not said anything, because I think he, personally, has not travelled there. He has taken us as far down as the village of Oramar. Quite close to that village there is one of the finest peaks in the whole country; but it would be excessively interesting to know what is the nature of the country below that, between Oramar and Rezan, that is part of the tract which the Oramar Kurds take in the course of their annual migrations. My own belief is that the country south of Oramar consists of a very low rolling plateau; certainly the Rudbar-i-shin itself flows at a very much lower elevation than the surrounding country. The Diza plain is at a level of about 6500 feet, and the village of Ishtazin lies about 1000 feet lower, that is about 5500 feet, and at Oramar the level of the stream is only 3300 feet, therefore there is a very rapid drop, and that explains to a great extent the extremely narrow and deep gorges which make travelling in that part of the country so difficult. I do not know that I have any other observations to make, and I can only congratulate Major

Maunsell on my own behalf, and I hope on behalf of the Society, for the most interesting and instructive paper he has read.

Major Maunsell: I should like to answer a few queries put by Earl Percy. As regards the petrified forest on the pass between Kochannes and Julamerk, I passed over that route, and could find no trace of it whatever; I do not think any could possibly exist. The country is mostly of shale formation, and, as far as I know anything of geology, I do not think such a thing would exist there. As regards the country between Oramar and Rezan, the formation is of flat-topped limestone ridges, with streams in deep narrow rifts, and much lower than the Sat-Dagh. The central ridge seems to be plentifully wooded on both sides, and towards the Rudbar-i-Shin has some fairly open, easy spurs on which are about a dozen villages, whose inhabitants come into Gavar in the summer, and later on go to the top of the Sat-Dagh. The Rudbar-i-shin leaves this country by a rude gorge which is almost impassable. As regards the general geology, I am afraid I can only speak as an amateur, but the country around Lake Van is remarkable for its various igneous formations. All round the Lake of Van are extinct volcanoes. On the western side is the great crater of Nimrod, which is 5 miles in diameter, but now extinct. On the north is the crater of Sipan Dagh, 13,700 feet; and away to the north-east towards Ararat is another large volcano, the Tendurek Dagh, which is still said to smoke slightly. But directly you reach the south shore of Lake Van an entirely different formation supervenes; there are no volcanic masses of any size until you get to the peak of Guraimiz Gavdan, which seems of an igneous formation, as well as the whole of the extremely rugged range which contains it. Most of that which contains the various "yailas" is shaly formation, and gives rise to easy-rolling slopes, which are suddenly broken by the great rocky wall of Deria-i-Zir and the Jelu mountains. As regards the settlement of the Jews, I went chiefly by the local tradition related to me in Mosul, and also in Akra, that they came from Mosul, the ancient city of Nineveh; but I do not know at what period they were brought from Palestine. The stone implements were dug up by the German expedition of Dr. Belck and Dr. Lehmann, who seemed to think that they were of a far more ancient date than what is called the Vannic Chaldean period.

The President: It only remains for us to thank Major Maunsell for his interesting paper. We have had accounts of this region before, and I can remember the paper that was read by Mr. Taylor, although it is more than forty years ago, and the very interesting discussion which followed, in which Sir Henry Rawlinson told us a great deal about the history of the country. Major Maunsell has shown us and described to us the beauty of the scenery, but I think this is enhanced by the extraordinary historical interest connected with the region between Lake Van and the valley of the Tigris. I remember Sir Henry Rawlinson expressing his opinion that this region is the Ararat where the ark rested, and not the peak in Armenia, the honours of which are only derived from a much more modern tradition. The country is also extremely interesting from the march of Xenophon through it after he left the valley of the Tigris. I believe a part of the country was also possessed by the Crusaders, and there are points connected with it of the deepest interest, such as the history of the marches that were made across it in the times of the Eastern Emperors; and, to go back to much earlier times, there are the remnants of the old religions of the East which remain in these valleys. The religion of the Yazidis is connected with the ancient bird which occurs so frequently in remote Persian history. It was called the *Malik Taus*, and was supposed to have been a peacock made either of bronze or of silver; but nobody knows the real history of that religion. All these historical points immensely enhance the interest connected with this magnificent scenery; but it is late now, and we have only time

to pass a very cordial vote of thanks to Major Maunsell for having given us such an excellent idea of the magnificent mountains of this part of Kurdistan. I am sure you will pass this vote of thanks unanimously. And I think we ought also to thank Earl Percy for his friendly criticism of this paper, through which a great deal of additional information, especially respecting the geology and archæology of the country, was brought out in Major Maunsell's reply.

NORTHERN BOLIVIA AND PRESIDENT PANDO'S NEW MAP.*

By Colonel GEORGE EARL CHURCH.

THE Royal Geographical Society is indebted to his Excellency Colonel José M. Pando, President of Bolivia, for a new and interesting map of the north-eastern part of that country, transmitted to us through his Excellency Señor F. Avelino Aramayo, the Bolivian minister to the court of St. James.† It includes the extensive explorations made personally by Colonel Pando between the years 1892 and 1898, and throws much-needed light upon an attractive section of South America, which, from the days of the Incas, has seemed to challenge exploration. It lies to the east of the cradle of the Inca empire, from which no man can look across Lake Titicaca at the magnificent range of white-bonneted peaks which marks the line of the inland Andes without an almost irresistible inclination to break through one of its gaps and plunge down the slope into the Amazon valley, to solve the mysteries which lie hidden there. The Inca Rocca, the successor of Manco Capac, entrusted to his son, Yaguarguaque, an expedition of 15,000 men to conquer this region, then called Antisuyu. He easily penetrated from Cuzco to Paucartambo, and thence, with great difficulties, to Tono—the first coca plantations of the Indians, but went no farther. Even the great Inca Yupanqui could not resist the temptation; and, according to Garcilaso de la Vega, sent a numerous, well-equipped army which reached the Tono river, spent two years in building rafts, descended the river Mayu-tata, or Amaru-mayu, and conquered the countries to the east of Cuzco as far as the plains of Musu, now known as Mojos.‡ It is probable that this expedition did not reach the falls of the Madeira, but on arriving at the level country, at about 12° S. lat., struck to the south-east and crossed the Beni river into the Mojos territory, keeping a short distance from the base of the foothills of the Andes in the more or less open lands.

* Map, p. 248.

† The geographical world will learn with pleasure that, continuing his services to science, President Pando concluded a contract, on February 15, 1901, for the survey of that part of the Andean plateau belonging to the Department of Oruro and La Paz, between Lake Titicaca, the Desaguadero, Pampa Aullagas, and towards the east to the summits of the inland range of the Andes.

‡ In the *Proceedings of the Royal Geographical Society* for June, 1883, will be found a most interesting paper on "The Basins of the Amaru-mayu and the Beni," by Sir Clements R. Markham.

Soon after the conquest of Peru by the Spaniards, the Inca domination of the region subdued by Yupanqui ceased, and the savage tribes at the eastern base of the Andes resumed their independence, which they have tenaciously guarded up to the last twenty years. The rule of the Incas was forgotten among them, except on the Tono river, where traces of Inca settlements can still be found.

Only a short period of time elapsed from the date of the Spanish conquest before an expedition of note attempted to reach the Mayutata. The conclusion of the civil war between the Pizarros and Almagros in Southern Peru (in 1538) left Hernando Pizarro surrounded by many dangerous and turbulent followers of whom he desired to rid himself. He therefore gave permission to Pedro de Candia to lead a body of three hundred men, across the Eastern Andes, from Cuzco into the Amazon valley. Herrera says that Candia entered by the slope which is limited on the north by the river Opotari and south by the valley of Cochabamba, which is called the Mojos road; and that, finally, he took the route across the Tono Andes, and, in Opotari, 3 leagues from Tono, found a large town, 30 leagues from Cuzco. Although terrorized at the difficulties which they encountered at every step, the men forced their way further onward, through a rough country covered with dense forests of ever-increasing thickness; but, after four days, they were opposed by savage hordes, who told them that they "had nothing but small houses covered with branches of trees, that their arms were bows and arrows, that they ate roots and yuca, which they cultivated, and with that they lived contented; and that in those forests there were monkeys and pumas and some tapirs, which they killed with arrows, and advised them not to go further on, because they were getting lost." After penetrating a little more to the east under almost incredible hardships, the expedition returned to the mountains.

Hernando Pizarro then deprived Candia of his command, and allowed one of his most esteemed companions, Pedro Anzurez de Camporedondo, to organize a force to conquer the province of Mojos by the way of Caravaya, the Inca name of which was Collahuaya. He gathered a large and enthusiastic body of adventurers, supported by several thousand Quichua Indians, and started, in 1539, from the town of Ayabire. He descended the mountains to Sandia and San Juan del Oro, centres for the working of the rich gold-washings of Caravaya, which had been exploited in Inca times, but by which pass is unknown—probably by one about 100 miles south of the river Tono. He then entered the present Bolivian province of Caupolican, called Zama, which is the Ixiamas or Ysiama of to-day, in the north of the same province. Ixiamas, Tumapasa, Aten, and Cavinas form a large district, west of the middle Beni river, occupied by the Tacana Indians. The expedition seems to have crossed this great river, which they

called the Amapalcas, and to have penetrated far to the south-east into the territory of Mojos. It probably reached the vicinity of the Mamoré river a little south of the present town of Trinidad. Then, sending out a small scouting party, a great river was discovered running from east to west, doubtless the Grande branch of the Mamoré. After five months of terrible hardships, the expedition returned to the town of Ayabire, having lost 4000 Indians and negroes and 143 Spaniards The former suffered from hunger to such an extent that as fast as their companions died the survivors ate them.

In 1576, the rival Spanish expeditions of Tordoya and Maldonado, numbering several hundred adventurers, penetrated to the headwaters of the Mayu-tata. Here they so fiercely fought against each other, for three days, in the dark, dense forests, that nearly all were killed. The few survivors were beset by the savages, who killed Tordoya and captured Maldonado. Other expeditions of minor importance followed during the Spanish colonial period, but accomplished nothing. In 1835, General Miller descended from Cuzco to the forests of Paucartambo; but, during the first half of the past century, the War of Independence and the general exhaustion which followed left the tribes on the eastern slope of the Andes to bury in oblivion the memories of Spanish inroads upon their forest strongholds.

In 1851, Lieut. Gibbon, of the U.S. Navy, reached the Tono and Mayu-tata from the Andean tableland, and as he gazed upon the riotous wealth of nature which surrounded him, and reflected upon the direction taken by the great river at his feet, he wrote, "All the silver and gold of Peru are not to be compared with the undeveloped commercial resources of this beautiful garden." There he found the brave and good Padre Bovo de Revello, an Italian Carmelite monk, with his little flock of neophytes. He had changed the name of the river "Amarumayu" of the Incas to "Madre de Dios," for the reason that the savages, after having killed a number of his people and destroyed their church, had thrown the image they worshipped into the water, which had floated down-stream, and was afterwards found on a rock in the middle of the Mayu-tata. It seems destined to retain the name conferred upon it by the pious father, although it is known to the Tacana Indians along its banks as the Mayu-tata, or Great Father river.

Markham followed Gibbon, and in 1853 descended from Cuzco, and obtained a view of the Mayu-tata, believing, like Gibbon, that it was the upper Purus.

On December 26, 1860, the gallant Peruvian, Colonel Faustino Maldonado, with a most scantily equipped expedition, and only twelve men, essayed the task of descending the Mayu-tata throughout its course. He reached the Tono, at its confluence with the Piñi-piñi, where he embarked on a rudely constructed raft, passed the mouth of the Inambari on January 8, and, fighting his way through savage

tribes, entered the Beni, and, soon after, the Madeira, at the falls. Here he met a friendly tribe of Caripunas, who advised him, as they also advised me in 1872, to always keep to the right bank in descending that formidable line of cataracts. On March 18, six of the party, in a bark canoe, had the unfortunate idea to take the west side of the river at the Caldeirão do Inferno (Cauldron of Hell). Four of them were lost, including Maldonado. This cataract has a length of about 1½ mile. For the first quarter of a mile it falls over 7 feet, and for the remainder of the distance 13 feet. The volume of water it carries is immense, the river being about a mile wide. In descending, it is the custom to hug the right bank at the commencement, but I got caught in a violent current in mid-river and could not gain the shore. My canoe, with her twelve Indian paddlers, was not 5 inches out of water. The great stream seemed to hollow in the middle, as if the bottom were dropping down. A reef, extending from an island, crossed it diagonally, showing a high and angry wall of foam. Towards this barrier, the current drove us with frightful velocity. My Indians were dismayed, and were on the point of jumping overboard, as is their custom in such dangers, when I seized a Colt's army revolver and swore I would shoot the first one who disobeyed an order. The little craft danced almost upon the edge of the reef, when it was suddenly caught by an eddy, thrown to the right, and whirled round the flank of the reef into open water, between it and the shore. All this was tame in comparison to what now met my eye. To quote from my journal, "We shot currents, rapids, whirlpools, waves, and foam as lightning zigzags through a cloud. We went down the main cataract at the rate of 20 miles an hour. I stood in front of our little rush cabin, waving my revolver to the right or left as I desired to indicate the direction the captain should steer. In mid-river, along the lower reach of the rapids, was a ridge of water perhaps 40 feet wide in its widest place. On its rounded edge, sharp, spiteful waves of foam were playing. On each side there was a return of the river forming a gigantic whirlpool, and, as we shot along the crest, the return waters sped up-stream with dizzy velocity. Twice the side of the canoe nearly touched them—twice grazed death; but my muscular Indians and their cool, splendid captain, Pedro Ycho, took us safely through." This is the fall where Maldonado lost his life, after solving the problem of centuries as to the course of the Mayu-tata. A few years later, the exploration of the Purus, by Chandless, demonstrated, mathematically, that this river had no connection with the streams so many travellers had seen at the foot of the Andes, east of Cuzco.

In 1865, Antonio Raimondi descended the Paucartambo river a short distance below the town of that name, and then crossed the inland range, eastwards, towards the sources of the Mayu-tata by the Cusilluyoc pass. By a steep descent, he reached the plains on the following day, "populated towards the close of the past century by numerous flourishing

estates of cacao and coca, a region which, later, was the theatre of sanguinary struggles with the savage Huachipairis and Tuyeneris, who destroyed, in a few days, the work of many years." He then examined the upper rivers which unite to form the Mayu-tata, and returned to Paucartambo.

Colonel La Torre, Prefect of Cuzco, pronounced "the Madre de Dios the broad, open tomb for explorers." It received him also, in his expedition of 1873. He reached a point near the main river, and died pierced by thirty-four Indian arrows.

Besides the numerous efforts made to explore and occupy the region of the Mayu-tata by descending the Andes to the east of Cuzco, numerous expeditions, during and after the Spanish colonial period, attempted to reach the lower Beni and Mayu-tata districts by way of the Beni river from La Paz, and from Sandia, on the Caravaya slope of the Andes. The Franciscan convent at La Paz was especially zealous in its efforts to establish missions in the district in question, and clung tenaciously, but not always successfully, to any foothold it gained. Cavinas, on the middle Beni, appears to have been its main outpost.

In 1560, Diego Aleman, a resident, and one of the founders, of La Paz, organized a company to discover the territory watered by the Mayu-tata. He descended the mountains to the north of Cochabamba, but, on the border of Mojos, was routed and made prisoner by the Indians. Then followed the Licenciados Balboa and Garcés, who reached the Mayu-tata, but returned on account of insufficient resources. The information gained caused Padre Miguel de Urrea to penetrate the region. After remaining for a considerable period of time, he was killed by the Sabainas. Then followed the Curate Calacoto, who was forced to return without results.

Padre Rafael Sains, in his "Memoria historica del Colegio de San José de la Paz" (unpublished),* says that Pedro de Aleguí Urquiza obtained from the king a privilege to conquer Caupolican. With a strong expedition, he founded his first town, San Juan de Sahagun de Mojos. He then founded Apolobamba, and pressed on to Aquachile, an Indian town, where he died of fever. His disheartened followers then abandoned the two last-named places and retired to Mojos. Urquiza was governor of the famous gold district of Tipuani, and discovered the ancient military road which the Incas opened by Suri and Camata. "It passes near Atén by the height of Altuncama, near Apolobamba, and runs northward; then goes through the gorge of Siliamas and continues to San José de Chupiamonos. At the high points of the *pampa*, it has small fortifications. Its width is very regular, and the road is paved according to its locality. It presents well-founded proof

* See 'Limites de la provincia de Caupolican ó Apolobamba,' por Carlos Bravo La Paz, 1890.

that, before the Inca Yupanqui entered Mojos, the inhabitants of Laricasa, Humasuyu, and Pacasa had communication with the peoples or tribes situated on the other side (the north) of the Amaru-mayu."

Padre Gregorio Bolivar, in 1620, and afterwards in 1631, pushed northward from La Paz into the lower Beni and Mayu-tata, but was never heard of afterwards. In 1629, the Jesuit father Bernado Rheus, from the Andes of La Paz, penetrated to the north of Apolobamba and perished by the hands of the savages. The Dominican monk Tomás de Chaves wandered for fourteen years to the north of Cochabamba in Mojos and the Beni. He returned to the convent of La Paz, and died about 1656. Friar Domingo Alvarez de Toledo took up the work, and, by the way of Caravaya, went 40 leagues northward into the territory of the Toromona savages in the Mayu-tata basin.

Padre Rafael Sains states that Gabriel Gonzales undertook the conquest of Paititi in 1670. He descended the river Beni, but his expedition was fruitless, and he returned. Several missionaries from Caravaya, whose names he gives, reached the lands of the Araonas in 1680, where they remained two years, and retired disconsolate at the ill success of their mission. Seven more then went from Sandia, and under most disheartening difficulties, founded ten *reductions*, or Indian settlements, in two years, some of which were afterwards abandoned. From this time forward, the persistent missionary fathers, especially those of the convent of La Paz, generally held to the ground they had gained, but never found it possible to effect a permanent lodgment in the basin of the Mayu-tata. It is probable that, in the eighteenth and nineteenth centuries, they possessed much more information than the geographical world in general regarding northern and north-western Bolivia, and that the convents of Cuzco, Moquegua, Juli on Lake Titicaca, and La Paz still contain much unpublished data describing the country, the course of the rivers, and manners and customs of the Indian tribes.

In 1879, my friend Antonio Raimondi published, for the first time, a letter which P. José Figueira, who in 1803 was curate at Cavinas, wrote to the superior of his college at Moquequa, describing a voyage which he made down the Beni from Cavinas. It seems that he reached a point near the confluence of the Beni with the Mamoré and "very close to the mouth of the rio Magno," or Mayu-tata, "which receives all the water of the mountains of Cuzco." The information given to him by an Indian chief, Yusayri, left no doubt that the Mayu-tata was the main affluent of the Beni.

The intrepid Padre Mancini, who resided from 1850 to 1864 in Mocetenes and northern Caupolican, directed his steps westward from his mission station, and, alone, with cross in hand, travelled over an immense area of unknown country, visiting many Indian tribes, such as the Guacanaguas, Machuis, and Toromonas. He then turned northward,

remained for a time with the Araonas, crossed the Mayu-tata, and entered the country of the Pacahuaras, lying between that river and the Purús. He made a rude map of his peregrinations, which I afterwards saw at the Recoleta Convent at La Paz, to which he belonged.

In 1866, two Franciscan friars, from the same convent, reached the Mayu-tata, five days' journey north-west from their mission at Cavinas. In 1869, in La Paz, I often met one of these good men, Padre Fidel Codinach, a native of Spain, of half Spanish, half French blood, who gave me much information regarding the valley of the Mayu-tata and many notes from his journal. "Between the Madidi branch of the Beni and the Mayu-tata, besides a considerable district north of the latter river, all of the tribes speak the Tacana language. It is almost totally different from either Quichua or Aymará. The Tacanas cannot count beyond six. South of the mouth of the Madidi, and between the Unduma and Tegéque branches of the Beni, is found the mission of Ysiama. Near it passes an Inca road, running from the direction of Cuzco towards the bank of the Beni. The road is about 25 feet wide, and long lengths of it, well paved, are still visible. With reference to the lands occupied by the Tacana tribes, they are unsurpassed in beauty, as much for their topography as for their fertility and richness. They cover a broad space, about four degrees of latitude and about eight of longitude. The position is exceedingly agreeable—now extensive groves, which are suddenly replaced by delightful pasture lands, now by brooks, rivers, and lakes filled by numerous classes of fish. The most perfect salubrity of climate exists, despite the warm temperature. The groves are delightful and filled with all that gives pleasure—the leafy and productive almond-tree" (probably the Brazil nut), "the aromatic gum and the palm, ranging from the highest to the lowest, from the royal to the smallest. Hidden riches exist in these lands, grateful and filled with perfume, gum and wax abundant and varied. Here are found cabinet-woods, medicinal plants, and many other valuable productions, without mentioning the great minéral wealth of the district."

But the vast and beautiful region lying north-west of the Madidi and Beni rivers as far as the Aquiry branch of the Purus, and bisected by the Mayu-tata, was practically valueless to the commercial world, and cut off almost entirely from it, so long as the dreaded lower reach of the river Beni remained unexplored. When I descended the falls of the Madeira, the imagination of my boatmen, as I made them paddle a few miles into the mouth of the Beni, peopled this region with the most ferocious tribes of savages, and filled the river itself with obstacles to which those of the Madeira were only child's play. Augustin Palacios, Bolivian "Administrator of Rents" in the Beni province, had, in 1846, ascended the Beni to the rapid of Esperanza, near its mouth, and made a sketch of it. Above this was the *unknown*, with its terrors. At length, in 1880–81, Dr. Edwin R. Heath, an American who had been

professionally employed in my effort to open Bolivia to the commerce of the world, explored and mapped the Beni from Reyes to its mouth. The most of it was done in an old boat, 15 feet long and 4 feet wide, which Dr. Heath found submerged. He says,* "Bow and stern I could thrust my hand through. Pulling it on land, we caulked it with Indian corn husks, and plastered mud over them." With two Indian paddlers he accomplished his daring exploration successfully, but, all the way, found it difficult to keep his wretched craft from sinking. He solved a great geographical problem with the most primitive means that could be devised. The commercial effect upon the region which he opened was immediate and marvellous.

Previous to Heath's exploration, rubber trees had been discovered at Cavinas in 1869 or 1870, and, the quality of the rubber proving excellent, about 185 Bolivians were employed in the business of exploiting the neighbouring district. The product in 1880 was 104,000 lbs. Within two years from the exploration, the number of men engaged had increased to about 1500. Now they number several thousand, and have made prosperous settlements along the banks of the Beni, the Mayu-tata, the Orton, Abuna, the Aquire branch of the Purus, and numerous other streams which drain the vast region, now generally known as the Acre and Madre de Dios district, which comprises all of the great triangular area of Bolivia lying north-west of the Madidi and Beni rivers, and which is bounded on the north-east by Brazil and south-west by Peru. The precious gum, the best in the Amazon basin, is found here in such abundance that it has given large fortunes to the collectors. These, objecting to the export duties levied by Bolivia, recently made a revolution declaring their independence, relying upon their almost inaccessible position and the arms and ammunition which their wealth had enabled them to accumulate to defend themselves against any force which the government might be able to send against them. The energy of President Pando was equal to the occasion, and, a few months ago, the revolution was suffocated by prompt and efficacious military measures, carried out under enormous difficulties by my old friend Colonel Juan L. Muñoz.

Naturally, the disturbances in the Acre territory have, for 1899 and 1900, diminished the rubber exportation of Bolivia, which is estimated for the past year at about 2,000,000 kilos, worth about $2 gold per kilo.

M. Vicente Ballivian gives the Bolivian export as follows:—

For 1896	... ...	1,140,712 kilos.
„ 1897	... ...	1,674,216 „
„ 1898	... ...	3,155,955 „

Of this quantity for 1898, however, 2,000,000 kilos was the *estimated* product of the Acre region.

* See *Proceedings of the Royal Geographical Society*, June, 1883.

Some rubber from the Beni district is sent across the Andes and exported from the Peruvian port of Mollendo. The last report of the Bolivian Minister of Finance fixes the quantity for the first half of 1900 at 157,200 kilos, say 314,400 kilos for the year.

The export from Puerto Suarez *viâ* the river Purus for the last half of 1899 was 45,918 kilos, or say for the year 91,836 kilos. The export duties for the first quarter of 1900, collected at Villa Bella, at the confluence of the Beni and Mamoré rivers, which represent the quantity of rubber sent down the falls of the Madeira, amounted to $66,658 Bolivian silver, a sum which corresponds to about 416,612 kilos.

A Bolivian and Brazilian commission of demarcation is now engaged tracing the north-east boundary-line between Brazil and Bolivia, which, according to the treaty of March, 1867, between those powers, runs from the junction of the Beni and Mamoré directly to the extreme head-waters of the Javary river, which stream, throughout its course, is the boundary between Brazil and Peru.

There is no treaty of limits between Bolivia and Peru. The boundary, thus far more or less recognized, is the one which existed between the viceroyalties of Peru and Buenos Aires at the time of the independence from Spain. Peru claims territory to the east of the Inambari affluent of the Mayu-tata, while Bolivia could claim Sandia and Caravaya up to the Vilcanota inland range of the Andes, which were not incorporated in the bishopric of Cuzco.* The line will probably be defined ultimately on the principle of *uti possidetis*, and it seems probable that the one generally fixed by geographers as the proper boundary is more or less just. It is the same as is found on President Pando's map, extending along the course of the Inambari to its mouth, and thence directly to the headwaters of the Javary.

Colonel Pando's map bears evidence of having been made with scientific care. It gives us the names of the numerous affluents of the main rivers and their branches, while the eastern drainage system of the Caravaya range of the Andes, from Cuzco south-east, is shown in great detail—sources from which the Pando, Inambari, Marcapata, and other great south-western tributaries of the Mayu-tata draw their immense volumes of water. But the most remarkable feature of the map is the course given to the Paucartambo river, which is shown to be the main affluent of the Manu-tata or Madre de Dios. The Paucartambo, which rises in the Vilcanota mountains and runs north-west, leaving Cuzco only 30 miles to the left, in a straight line, has heretofore been considered as a branch of the Urubamba affluent of the

* Alto Peru, which formed part of the viceroyalty of Peru, was separated from this and incorporated with that of Buenos Aires by royal *cedula* of August 8, 1776. A royal *ordinanza*, of January 28, 1782, determined that the district of La Paz "should include all of the bishopric of that name and also the provinces of Lampa, *Caravaya* and Azangaro."

Ucayali. It seems, however, that the Paucartambo gives a great bend to the east, at about lat. 11° 20′, breaks through the mountains, and thence, under the name of the Manu, flows south-east to join the Mayu-tata. The course of the Manu was perhaps roughly mapped by Fiscarrald, when, in 1894, from his rubber estate, at the confluence of the Tambo and Urubamba, he ascended the latter stream to its Camisea branch, which enters it from the east, and in an hour's time crossed a narrow divide to a small affluent of the Manu, which he descended to the Mayu-tata. I have no knowledge of the Paucartambo ever having been explored between Cuzco and its heretofore supposed junction with the Urubamba. Its valley is occupied by savage tribes, and the river, as far as the point where Fiscarrald struck it, courses through the mountain gorges of one of the wildest and most broken sections of Peru. Like the Apurimac, it must be a succession of violent rapids and cataracts. It would be very interesting to have the *data* upon which the course of the Paucartambo, as now shown, is based. There are general reasons for the belief that Colonel Pando's map gives approximately its real course, and that he has made a correction of the first importance in the geography of South America.

The vigorous and brave defence which numerous savage tribes have made of the territory they occupy in the valleys of the Mayu-tata and Beni for hundreds of years, is perhaps the best proof of its value as an abode for man; and indeed it would be difficult, in any part of the world, to find a more beautiful and seductive region, where climate, fertility of soil, hill, dale, mountain slope, forest, rich savana, lake and river are more delightfully mingled, the whole teeming with varied animal life and abounding in such gifts as nature lavishly confers only when in her most prodigal and generous mood. It is this region, with its sturdy aboriginal people, which is now rapidly being brought under the lash of *civilization*. The map of President Pando shows all the principal rivers of this savage Arcadia, lays bare the mysteries which Inca, Spaniard, and his descendant warred for many a century to fathom, and the world owes to President Pando and his able coadjutors its recognition for an extremely valuable contribution to geographical knowledge.

THE NATIONAL ANTARCTIC EXPEDITION.

THE following are the instructions to the Commander of the Expedition and the Director of the Civilian Scientific Staff, as finally arranged between the Royal Society and the Royal Geographical Society, and accepted by the Joint Antarctic Committee.

INSTRUCTIONS TO THE COMMANDER.

1. The Royal Society and the Royal Geographical Society, with the assistance of His Majesty's Government, have fitted out an Expedition for scientific discovery and exploration in the Antarctic Regions, and have entrusted you with the command.

2. The objects of the expedition are (*a*) to determine, as far as possible, the nature, condition, and extent of that portion of the south polar lands which is included in the scope of your expedition; and (*b*) to make a magnetic survey in the southern regions to the south of the 40th parallel, and to carry on meteorological, oceanographic, geological, biological, and physical investigations and researches. Neither of these objects is to be sacrificed to the other.

3. The scientific work of the executive officers of the ship will be under your immediate control, and will include magnetic and meteorological observations, surveying and charting, and sounding operations.

4. Associated with you, but under your command, there will be a civilian scientific staff, with a Director at their head. A copy of his instructions accompanies these instructions to you.

5. In all questions connected with the scientific conduct of the Expedition you will, as a matter of course, consider the Director as your colleague, and on all these matters you will observe such consideration in respect to his wishes and suggestions as may be consistent with a due regard to the instructions under which you are acting, to the safe navigation of the ship, and to the comfort, health, discipline, and efficiency of all under your command. Those friendly relations and unreserved communications should be maintained between you which will tend so materially to the success of an expedition from which so many important results are looked for.

6. As the scientific objects of the Expedition are manifold, some of them will come under the immediate supervision of the Director and his staff; others will depend for their success on the joint co-operation of the naval and civil elements, while some will demand the undivided attention of yourself and your officers. Upon the harmonious working and hearty co-operation of all must depend the result of the Expedition as a whole.

7. The Expedition will be supplied with a complete set of magnetic instruments, both for observations at sea and on shore. Instructions for their use have been drawn up by Captain Creak, R.N., and yourself and three of your officers have gone through a course of instruction at Deptford with Captain Creak and at Kew Observatory. The magnetic observatory on board the *Discovery* has been carefully constructed with a view to securing it from any proximity to steel or iron, and this has involved considerable expense and some sacrifice in other respects. We therefore impress upon you that the greatest importance is attached to the series of magnetic observations to be taken under your superintendence, and we desire that you will spare no pains to ensure their accuracy and continuity. The base station for your magnetic work will be at Melbourne, or at Christchurch in New

Zealand. A secondary base station is to be established by you, if possible, in Victoria Land. You should endeavour to carry the magnetic survey from the Cape to your primary base station south of the 40th parallel, and from the same station across the Pacific to the meridian of Greenwich. It is also desired that you should observe along the tracks of Ross, in order to ascertain the magnetic changes that have taken place in the interval between the two voyages.

8. Geographical discovery and scientific exploration by sea and land should be conducted in two quadrants of the four into which the Antarctic Regions are divided for convenience of reference, namely the Victoria and Ross Quadrants. It is desired that the extent of land should be ascertained by following the coast-lines, that the depth and nature of the ice-cap should be investigated, as well as the nature of the volcanic region, of the mountain ranges, and especially of any fossiliferous rocks.

9. A German Expedition will start at the same time as the *Discovery*, and it is hoped that there will be cordial co-operation between the two expeditions as regards magnetic and meteorological observations, and in all other matters if opportunities offer for such co-operation. It is understood that the German Expedition will establish an observatory on Kerguelen island, and will then proceed to explore the Enderby Quadrant, probably shaping a course south between the 70° E. and 80° E. meridians, with the object of wintering on the western side of Victoria Land, whence exploring sledge-parties will be sent inland. The Government of the Argentine Republic has undertaken to establish a magnetic observatory on Staten island.

10. You will see that the meteorological observations are regularly taken every two hours, and also, in accordance with a suggestion from the Berlin Committee, every day at Greenwich noon. It is very desirable that there should, if possible, be a series of meteorological observations to the south of the 74th parallel.

11. As regards magnetic work and meteorological observations generally, you will follow the programme arranged between the German and British Committees, with the terms of which you are acquainted.

12. Whenever it is possible, while at sea, deep-sea sounding should be taken with serial temperatures, and samples of sea-water at various depths are to be obtained, for physical and chemical analysis. Dredging operations are to be carried on as frequently as possible, and all opportunities are to be taken for making biological and geological collections.

13. Instructions will be supplied for the various scientific observations; and the officers of the Expedition will be furnished with a manual, prepared and edited by Dr. George Murray, on similar lines and with the same objects as the scientific manuals supplied to the Arctic Expedition of 1875.

14. On leaving this country you are to proceed to Melbourne, or Lyttleton (Christchurch), New Zealand, touching at any port or ports on the way that you may consider it necessary or desirable to visit for supplies or repairs. Before leaving your base station you will fill up with live stock, coal, and other necessaries; and you will leave the port with three years' provisions on board, and fully supplied for wintering and for sledge-travelling.

15. You are to proceed at once to the edge of the pack, and to force your vessel through it to the open water to the south. The pack is supposed to be closer in December than it has been found to be later in the season. But this is believed to depend rather on its position than on the time; and the great difference between a steamer and a sailing vessel perhaps makes up for any difference in the condition of the pack.

16. On reaching the south water, you are at liberty to devote to exploration the earlier portion of the navigable season; but such exploration should, if possible, include an examination of the coast from Cape Johnson to Cape Crozier, with a view to finding a safe and suitable place for the operations of landing in the event of your deciding that the ship shall not winter in the ice.

The chief points of geographical interest are as follows: To explore the ice-barrier of Sir James Ross to its eastern extremity, to discover the land which was believed by Ross to flank the barrier to the eastward, or to ascertain that it does not exist; and generally to endeavour to solve the very important physical and geographical questions connected with this remarkable ice-formation.

17. Owing to our very imperfect knowledge of the conditions which prevail in the Antarctic seas, we cannot pronounce definitely whether it will be necessary for the ship to make her way out of the ice before the winter sets in, or whether she should winter in the Antarctic Regions. It is for you to decide on this important question after a careful examination of local conditions.

18. If you should decide that the ship shall winter in the ice, the following instructions are to be observed:—

(*a*) Your efforts, as regards geographical exploration, should be directed, with the help of depôts, to three objectly, namely, an advance into the western mountains, an advance to the south, and the exploration of the volcanic region.

(*b*) The Director and his staff shall be allowed all facilities for the prosecution of their researches.

(*c*) In carrying out (*a*) and (*b*), due regard is to be had to the safety and requirements of the Expedition as a whole.

(*d*) You have been provided by Sir Leopold McClintock and by Dr. Nansen with complete details respecting sledge-work both by men and dogs, and you have yourself superintended every item of the preparations connected with food, clothing, and equipment. You will be guided by the information and knowledge thus acquired.

(*e*) Lieut. Armitage, R.N.R., who has been appointed second in command and navigator to the Expedition, has had experience in the work of taking astronomical, magnetic, and meteorological observations during three polar winters. He has also acquired experience in sledge-travelling, and in the driving and management of dogs. You will, no doubt, find his knowledge and experience of great use.

(*f*) Early in 1903 your ship should be free from the ice of the winter quarters, and you will devote to further exploration by sea so much of the navigable season as will certainly leave time for the ship to return to the north of the pack ice. Having recruited at your base station, you will then proceed with your magnetic survey across the Pacific, and return to this country.

19. If, on the other hand, you should decide not to winter, you will bear in mind that it is most important to maintain scientific observations on land throughout the winter, and therefore, if you are able, in consultation with the Director, to find a suitable place for a landing-party between Cape Johnson and Cape Crozier, and decide that such a party can be landed and left without undue risk, the following instructions will apply:—

(*a*) You will land a party under the command of such person as you may appoint. Such party shall include the Director, the physicist, and one of the surgeons, and such other persons as you may consider desirable. But no person is to be left without his consent in writing, which you will be careful to obtain and preserve.

(*b*) You will give every practical assistance in establishing on land this party, which you will supply with all available requisites, including a dwelling hut, an observer's hut, three years' provisions, stores, fuel, sledges and dogs.

(*c*) No landing party is to be established on any other part of the coast than that between Cape Johnson and Cape Crozier, as it is above all things essential that in case of accident the approximate position of the party should be known.

(*d*) Before it is so late as to endanger the freedom of your ship, you will proceed north of the pack and carry out magnetic observations with sounding and dredging over as many degrees of longitude (and as far south) as possible, so long as the season and your coal permit, and then return to your base station, whence you will telegraph your arrival and await further instructions.

20. You are to do your best to let us have, and to leave where you can, statements of your intentions with regard to the places where you will deposit records, and the course you will adopt, as well as particulars of your arrangements for the possible need of retreat, so that in case of accident to the ship, or detention, we shall be able to use our best endeavours to carry out your wishes in this respect.

21. In an enterprise of this nature, much must be left to the discretion and judgment of the commanding officer, and we fully confide in your combined energy and prudence for the successful issue of a voyage which will command the attention of all persons interested in navigation and science throughout the civilized world. At the same time we desire you constantly to bear in mind our anxiety for the health, comfort, and safety of all entrusted to your care.

22. While employed on this service, you are to take every opportunity of acquainting us with your progress and your requirements.

23. In the unfortunate event of any fatal accident happening to yourself, or of your inability, from sickness or any other cause, to carry out these instructions, the command of the ship and of the expedition will devolve on Lieut. Armitage, who is hereby directed to assume command, and to execute such part of these instructions as have not been already carried out at the time of his assuming command. In the event of a similar accident to Lieut. Armitage, the command is to devolve on the executive officer next in seniority on the Articles, and so on in succession.

24. All collections, and all logs (except the official log), journals, charts, drawings, photographs, observations, and scientific data will be the joint property of the two Societies, to be disposed of as may be decided by them. Before the final return of the expedition, you are to demand from the Naval Staff all such data, which are to be sealed up and delivered to the two Presidents, or dealt with as they may direct. The Director of the civilian scientific staff will be similarly responsible for the journals, collections, etc., of the officers under his control. You and the other members of the Expedition will not be at liberty without our consent to make any communication to the press on matters relating to the affairs of the Expedition, nor to publish independent narratives until six months after the issue of the official narrative. All communications are to be made to us, addressed to the care of the Secretary of the National Antarctic Expedition, London.

25. The *Discovery* is not one of His Majesty's ships, but is registered under the Merchant Shipping Act, 1894, and is governed by it. Copies of this Act will be supplied to you. You will see that the officers and crew sign the ship's articles as required by the Act. The scientific staff will not sign articles, but are to be

treated as cabin passengers. You must be careful not to take more than twelve persons as passengers.

26. The vessel has been covered by insurance, and, in the event of her sustaining any damage during the voyage, to recover the claim from the underwriters, it will be necessary for you to call in the services of Lloyd's agent, or in his absence, an independent surveyor, at the first port of call, in order that the damage may be surveyed before repairs are effected. His survey report, together with the accounts for repairs and supporting vouchers, should be sent to us by first mail, together with a certified extract from the official log reporting the casualty.

In the event of damage occurring after you have left civilized regions, precise particulars should be entered in the log, and the damage should be surveyed and repaired as soon as you return to a port where Lloyd's agent, or other surveyor, is available.

27. The *Discovery* is the first ship that has ever been built expressly for scientific purposes in these kingdoms. It is an honour to receive the command of her; but we are impressed with the difficulty of the enterprise which has been entrusted to you, and with the serious character of your responsibilities. The Expedition is an undertaking of national importance, and science cannot fail to benefit from the efforts of those engaged in it. You may rely upon our support on all occasions, and we feel assured that all on board the *Discovery* will do their utmost to further the objects of the Expedition.

Instructions to the Director of the Civilian Scientific Staff.

1. The Royal Society and the Royal Geographical Society have approved your appointment as Director of the Civilian Scientific Staff of their Antarctic Expedition.

2. A copy of the instructions to the Commander of the Expedition accompanies these instructions, which are supplemental to them. You will see from the instructions to the Commander what the objects of the expedition are, and your position relatively to him.

3. You will direct the scientific work of the gentlemen who have been appointed to assist you.

4. The names of the gentlemen associated with you are as follows: (1) Mr. Hodgson (*Biologist*); (2) Mr. Shackleton (*Physicist*). The services of the two medical officers will be at your disposal for scientific work when not engaged on the work of their own department, namely, Dr. Koettlitz (*Botanist*), and Dr. Wilson (*Zoologist*).

5. You will note that the Commander of the Expedition has been instructed to communicate freely with you on all matters connected with the scientific objects of the Expedition, and, as far as possible, to meet your views and wishes in connection with them. The Societies feel assured that you will co-operate and act in concert with him, with a view, as far as possible, to secure the success of an enterprise which it is hoped will be attended with important results in the various branches of science which it is intended to investigate.

6. All collections, logs, journals, charts, drawings, photographs, observations, and scientific data will be the joint property of the two Societies, to be disposed of as may be decided by them. Before the final return of the Expedition, you are to demand from the staff under your control all such data, which are to be sealed up and delivered to the two Presidents, or dealt with as they may direct. On the return of the Expedition, you will be expected to superintend the distribution of specimens to specialists approved of by the two Councils or their

representatives, and to edit the resulting reports. You will also be expected to contribute a report on the scientific results of the Expedition for the official narrative. As it may be desirable during the progress of the voyage that some new scientific discovery should be at once made known in the interests of science, you will, in such a case, inform us of it by the earliest opportunity.

7. You and the other members of the Expedition will not be at liberty, without our consent, to make any communication to the Press on matters relating in any way to the affairs of the Expedition, nor to publish independent narratives until six months after the issue of the official narrative. All communications are to be made to us, addressed to the care of the Secretary of the National Antarctic Expedition, London.

8. Should any vacancies in the scientific staff occur after the Expedition has sailed from England, you may, with the concurrence of the Commander, make such arrangements as you think desirable to fill the same, should no one have been appointed from England.

9. You and the members of the scientific staff will be cabin passengers joining the Expedition at your own risk, and neither the owners nor the captain are to be responsible for any accident or misfortune which may happen to you. You will obtain from each member a letter to this effect.

The instructions are signed by the Presidents of the two Societies.

Mr. George Murray, F.R.S., Director of the Botanical Department of the British Museum, has been appointed Director of the Civilian Scientific Staff. Mr. Murray will proceed to Melbourne or Lyttleton with the *Discovery*, but will not be required to go further. Meanwhile, on the voyage out, he will, in conjunction with the Commander, appoint a principal member of the Scientific Staff who shall carry out the scientific work on the lines laid down by the Director. On the return of the Expedition Mr. Murray will, as Director, be the editor of the scientific results.

As in the case of the British Expedition of 1875–76, a manual has been prepared for the use of the staff of the expedition, which is thus provided, in a handy form, with information likely to prove of value in the course of the scientific investigations. The 'Antarctic Manual' is ably edited by Mr. George Murray, Director of the Civilian Scientific Staff, and includes contributions by a large number of experts on the various branches of science on which research will be made. These, which form the first part of the manual, may be regarded as instructions to the staff on the methods to be employed, while the second section consists of reprints or translations of narratives of antarctic voyages not generally accessible. Lastly, an Antarctic Bibliography, certainly the fullest and most complete ever yet prepared, has been supplied by Dr. H. R. Mill.

A brief indication only of the various subjects treated of in the first section can be given here. Each contribution is by a recognized authority on the subject with which it deals, and a glance at the list of names is sufficient to show the solid value of the instructions supplied. A glossary, by Sir Clements Markham and Dr. Mill, of nautical and

scientific terms used in reference to ice is first given, after which come contributions on astronomy, by the superintendent of the Nautical Almanac; on tidal observations, by Prof. G. H. Darwin; on pendulum observations, by Prof. R. T. Glazebrook; and on terrestrial magnetism, by Captain E. W. Creak. An important section is the programme for international co-operation during the period in which the Expedition will be at work, which, if carried out, should add greatly to the value of the results. The section on climate includes, besides notes by Mr. R. H. Scott, Dr. Supan, etc., an epitome of the observations taken on board the ships of recent expeditions to the antarctic. Commander Wilson-Barker supplies notes on wave-observing, Prof. Schuster on the aurora, and Lord Kelvin on atmospheric electricity. Mr. J. Y. Buchanan gives a series of general hints on chemistry and physics, paying especial attention to the methods of temperature observation and meteorological observations generally. Geology is dealt with by Dr. W. T. Blanford, volcanoes by Prof. Judd, and ice-observations by Profs. Bonney and J. W. Gregory. Notes on the different branches of zoology are given by various specialists, while the editor is responsible for the section on botany. Lastly, valuable hints on sledge-travelling are supplied by Admiral Sir Leopold McClintock.

The geographical section supplies narratives of antarctic voyages which are not readily accessible otherwise, either as forming parts of voluminous scientific reports, as those of Balleny, D'Urville, and Wilkes, or from having hitherto remained in manuscript. To the latter class belong the narrative of Captain John Biscoe, and the log of Balleny's second mate, both of which were presented to the Royal Geographical Society many years ago by Mr. Charles Enderby.

The Antarctic Bibliography, compiled by Dr. Mill, is the first so far published which makes any claim to completeness, and though no doubt a certain amount of antarctic literature exist which is not included, it is believed that no paper of any importance has been omitted. The arrangement is chronological, the earlier years, for which of course the entries are very limited in number, being grouped together, while, since the beginning of the nineteenth century, each year has its own heading. Dr. Mill also gives a useful chronological table of antarctic voyages, and indices both to the names of authors and to those of antarctic ships. The bibliography, which has involved much labour and research, should prove of great value, not only in connection with the present expedition, but to geographical students generally.

REVIEWS.

ASIA.

A Sikhim Road-Book.*

We note that the forms Sikkim and Kangchinjunga are here preferred to those used in the more recent surveys, Sikhim and Kanchinjinga. It seems desirable that the Government of India should adopt finally a single form of local names. Another detail which calls for remark is the discrepancy between many of the heights given on the sketch-map attached to this volume and those in the large-scale (2 miles to 1 inch) Transfrontier Maps. This affects mostly the peaks north of Kanchinjinga. These, we gather, were measured independently by the late Captain Harman in the first instance, and the heights assigned them do not rest, therefore, on the same authority as those of the peaks visible from the plains, which were included in the great general Trigonometrical Survey of India.

Take, for example, the three summits immediately north of Kanchinjinga. In the Transfrontier sheet the heights given are 23,320, 23,360, and 24,210; in Captain O'Connor's map, 23,350, 23,470, and 24,090. It would be interesting to orographers to know on what principle and by whom these alterations were made. They first appeared, we believe, in the 8-mile-to-the-inch Transfrontier sheet No. 7. It is curious that in that sheet the height of Siniolchum is omitted. In the height 19,650 given the Chorten Nima pass on Captain O'Connor's map, the text seems to show that an 8 should be substituted for the 9. The height of the Yeumtso La is reduced from 17,040 to 15,800 feet, and that of the Guicha La from 16,430 to 15,300 feet. These alterations need confirmation. The height of the termination of the Zemu Glacier, or rather, of the confluence close to it, is given as 12,800 feet: 13,000 feet may safely be quoted by geographers as the lowest limit of glaciers in this region.

The present volume supersedes an earlier edition, which had become obsolete. The primary object of its compilers has been, apparently, to afford such information as might be useful in the case of military operations on the Tibetan frontier, or a march on Lhasa. A number of routes are described in more or less detail as far as concerns the difficulties of the ground, the character of the paths, the nature of camping-grounds, and the means of crossing torrents. Neither scenery nor scientific observation find much place in the notes here provided. But the practical information afforded will naturally be of great use to

* 'Routes in Sikkim,' compiled in the Intelligence Branch of the Quarter-master General's Department in India, by Captain W. F. O'Connor, Royal Garrison Artillery. Calcutta, November, 1890.

travellers. The routes described range from the well-known horse-paths round Darjeeling to the remote passes east and north of Kanchinjinga. Perhaps the most novel piece of exploration recorded is Captain O'Connor's passage of the Chorten Nima pass in 1896, and his journey, within the Tibetan frontier, from it eastwards to the Kongra La and Giaogong. Captain O'Connor was the first European to visit the head of the Lhonak valley, which he describes in the following terms:—

"The whole of the district drained by the Naku Chu and Langpo Chu is called Lhonak, meaning 'the black south,' and is regarded by the Tibetans as their own property, and they very much resent the appearance there of any foreigner. . . . The actual head of the valley is a chaotic mass of glacier and moraine. There is said to be a pass, the Jonsong La, leading out of this valley into Nepal, but I was unable to ascertain whereabouts it lay; from the general configuration of the country it must be extremely lofty and difficult."

It is curious that Captain O'Connor should make no reference either to the accounts given by the native explorers, Rinsing and Chandra Das, of the Jonsong La, or to its passage in 1899 by an English party, of which Mr. C. Dover, of the Public Works Department in Sikhim, a contributor to the present road-book, was a member. It is true that it is not likely, judging from Mr. D. Freshfield's description (*Alpine Journal*, August, 1890) that this route will prove of much use for military purposes. We may note that Mr. Freshfield has stated that the gap to which he was led by Rinsing, the native explorer, as the Chorten Nima La, was not that pass, but a gap further east, connecting two sources of the Teesta (*Alpine Journal*, May, 1901).

The accounts of the Kang La and Guicha La routes are meagre; and the former pass is a long way from either Kabur or Kabru. On what may be called by comparison the main roads of Sikhim and the approaches to the Chumbi valley, the information given appears to be both accurate and sufficient. A route to Lhasa, an extract from an old native surveyor's report, may excite the envy and emulation of European travellers.

Lists of the bungalows kept up—perhaps this is hardly the right word, considering the condition of many of those in Independent Sikhim—and of circular tours, which may be conveniently made from Darjeeling, are added as an inducement to travellers. Distances are given in miles; in one case between Yoksun and Jongri, three marches are allowed for 17 uphill miles, a significant relation between time and space. Mr. Dover, however, and a worn-out troop of coolies descended them in one day in 1899.*

* With regard to the discrepancy in heights referred to above, and the omission of that of D_2, Mr. Douglas Freshfield sends us the following note, which he has recently received from Colonel St. G. Gore, R.E., the Surveyor-General of India:—

The Siberian Railway.

Among recent books on Russian Asia the most important is certainly the 'Guide to the Great Siberian Railway,' published by the Ministry of Ways of Communication (St. Petersburg, 1900). This thoroughly business-like work has been prepared under the supervision of Prince Khilkov, the Minister of Ways of Communication; it has been edited by MM. Dmitriev-Mamonov and Zdziarski; and the English translation has been made by Mlle. Kukol-Yasnopolski. It should be impossible for any one, even in England, to write in future about Siberia as it is without reference to this volume, which combines the gazetteer, the guide-book, and the album, with a careful industry and a discerning taste not too frequent. As to illustrations;—it contains 360 photogravure pictures of Siberian scenes and types, 4 maps of the country, 3 plans of towns, and 2 phototypes, and the execution of these is a credit to the Artistic Printing Society of St. Petersburg. The text opens with a geographical and historical review of Siberia, on pp. 1–52; an account of the construction of the Great Siberian Railway follows (pp. 53–80); and next we have a detailed account of the various sections of the line and the various belts of country from west to east through which it passes; *e.g.* from Samara to Zlato-ust (pp. 81–113), from Cheliabinsk to Ekaterinburg (pp. 113–120), from Ekaterinburg to Tiumen (pp. 120–126), from Cheliabinsk to the Ob (or the West Siberian line, pp. 173–218), from the Ob to Irkutsk (or the Mid-Siberian line, pp. 261–306), from Irkutsk to the Baikal Lake (pp. 307–313), from the Baikal to the Amur (or the Trans-Baikal line, pp. 363–376), from Khabarovsk to Vladivostok on the Pacific (or the Ussuri line, pp. 441–472), from the Upper Amur to Vladivostok and Port Arthur through Manchuria (the Manchurian or 'East Chinese' line, pp. 481–500). Besides these chapters, expressly devoted to the railway and its immediate neighbourhood, excursions are made to other regions, in dealing with the general questions of the development of Russian Asia; thus the island of Sakhalin is described on pp. 473–480, the Amur territory and waterway on pp. 377–418, Lake Baikal on pp. 327–338, the West Siberian plain and the Kirghiz and Baraba steppes on pp. 127–172. At the end of

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"As to heights, those on the 4 miles to the inch map by Colonel Tanner, published in 1886, are more reliable than those published on the 2 miles to the inch map of 1885 [N.E. Trans-Frontier, Sheet $\frac{NW}{1}$]. The cause of the difference is a recalculation of the triangles due to some new values being introduced at the bases.

"When the two signs △ and ○ appear on the same sheet, the triangle means that the point was a station of observation, and the theodolite was set up there; points marked with a circle were only fixed by the intersection of rays.

"The omission of the height of D_2 on the more recent map was, I think, a chance omission. Colonel Tanner fixed the point on the N.W. spur, and appears to have omitted the height of D_2, which had been previously determined (22,570).—St. G. Gore."

each section a serviceable bibliography is given; in reference to the Amur watercourse, so important as the riverine link between the two railway termini at Stretensk and Khabarovsk, the settlements and stations on the river-side are marked and described in great detail, especially in relation to the condition of the main stream and its affluents; and at the conclusion of the volume an appendix is added of fares and time-tables between St. Petersburg and the Pacific, not only by the railway, but by the fresh-water routes, on the Irtish, Ob, Tom, Angara, Baikal Lake, Amur and Ussuri (pp. 501–520). Among the illustrations, special attention may perhaps be directed to the photographs of the greater railway bridges, such as those over the Ob, Yenisei, Tobol, Tom, Khor, Ussuri, Irtish, etc.; see pp. 85, 91, 96, 180, 182, 191, 213, 268, 272, 287, 292, 449, 453, 454, 456, and 457, for the chief examples of these truly remarkable constructions.

The least full and satisfactory portion of the *Guide* is that given to the Trans-Baikal railway; but in view of the fact that this portion of the line was not entirely completed by the date of publication in 1900, it would perhaps be unreasonable to expect more. A photograph, *e.g.*, of the great bridge over the Selenga, could scarcely be expected before its inauguration. The following illustrations (all photographs), with the accompanying letterpress, may also be commended as giving some idea of recent progress towards civilization:—p. 361, the tea-bazaar in Kiakhta, on the Russo-Chinese frontier; p. 329, the ice-breaker dock near Listvennichnaya, on Lake Baikal; pp. 317–319, the Archæological and Anatomical Museums, the Library of Count Stroganov, the Physical Cabinets, Clinics, Students' College, and General University Buildings in the University of Tomsk; p. 316, the Trinity Cathedral in Tomsk; pp. 304–311, various churches, houses, schools, etc., in Irkutsk, and especially the Theatre and the Museum of the East Siberian branch of the Imperial Geographical Society; p. 279, the railway technical school in Krasnoyarsk; p. 251, the Museum of the Khaitin china manufactory; pp. 232–234, views in Barnaul and Biisk; pp. 216–217, views of the Ob-Yenisei canal and of an Ob steamer; pp. 199–202, workshops at Omsk; p. 179, the medical and feeding station for emigrants near Kurgan; p. 130, a museum in Tobolsk; pp. 124, 125, the steamers' quay and the museum of the modern school in Tiumen; pp. 117–20, views in Ekaterinburg (not perhaps quite worthy of that charming town), especially the Cathedral and Court of Justice; p. 98, the Miniar ironworks; p. 101, the Satka ironworks; p. 99, a railway cutting in the Urals; p. 181, the landing-place at Nikolaievsk, on the Amur; p. 34, a moveable school at an emigrant station; p. 455, a landing-stage on the Iman; pp. 378–383, mail and other steamers on the Amur; pp. 17 and 413, the mole and winter anchorage of steamers at Blagoveshchensk; p. 446, the offices of the Ussuri section of the Siberian railway at Khabarovsk;

p. 464, the railway terminus at Vladivostok; pp. 76, 77, 62, 218, 440, views of the *train de luxe* and its separate carriages. Excellent bibliographies are added at the end of each section; and statistical tables are to be found here, not only of areas and populations, but of animal and mineral resources and products, even lists of the chief mineral springs, as well as of the newspapers and manufactories of separate towns and districts, and of the steamers and barges on the inland waters, with their freights and tonnage (cf. pp. 345, 357, 401, etc.). The purport of this volume could hardly be better expressed than in the words of Mr. J. Young Simpson in his interesting and fair-minded 'Side Lights on Siberia:' "at once the reservoir of the Russian Empire and its cesspool. In the latter aspect it has been known of old time, the former distinction has only lately come to light." For here we have not only an appreciation of the value of the country, its hidden treasures and its fertile soil, but also a tacit recognition of the inadequacy and folly of certain older conceptions.

C. Raymond Beazley.

Leroy Beaulieu on Siberia.

M. Pierre Leroy Beaulieu's work on Siberia, Japan, and China, translated into English under the title of 'The Awakening of the East' (Heinemann, 1900, pp. xxvii., 589), appears to be one of the most serviceable, compact, and meritorious little books that have recently appeared on Asiatic subjects. Mr. Henry Norman contributes a preface. M. Leroy Beaulieu's Russian chapters follow a customary arrangement, beginning with history, and proceeding to description: chap. i. The Origins of Russian Expansion in Siberia, and the Natural Characteristics of the Country, pp. 1–8; chap. ii. The Land and its Inhabitants, pp. 9–16; chap. iii. Agricultural Siberia and the Rural Population, pp. 17–26; chap. iv. Mineral Resources and Industries, pp. 27–30; chap. v. Siberian Commerce and the Transport of Tea, pp. 31–37; chap. vi. Siberian Towns (treated with extreme brevity), pp. 38–42; chap. vii. Immigration, pp. 43–55; chap. viii. Means of Communication, pp. 56–63; chap. ix. The Siberian Railway, pp. 64–70; ch. x. The Railway through Manchuria, pp. 71–75; chap. xi. The Altered Relations between Europe and the Far East resulting from the Siberian Railway, pp. 76–80. On the whole, this is a trustworthy summary of the most modern knowledge on Siberia; M. Leroy Beaulieu has accumulated a great mass of facts, sifted them well, and packed them closely; his remarks are usually judicious, and sometimes acute; but occasionally he ventures on strange theories. Thus Peter the Great's ambition to expand his empire westward by the conquest of *Constantinople* (p. 3), is a little wild; and the Russians, taken as a whole, are not 'of Oriental

extraction,' though the Mongol and other Oriental strains in their blood are doubtless important.

C. R. B.

Hosie's 'Manchuria.'

Mr. Alexander Hosie's study of 'Manchuria: its People, Resources, and Recent History' (Methuen, 1901, pp. xii., 274) gives a record of a journey from Newchwang to Lake Baikal (pp. 73–134), as well as an account, evidently compiled with great care and knowledge, of the inhabitants and administration, physical features and climate, agriculture, animal and mineral products, special industries and trade, of Manchuria (pp. 135–262). Mr. Hosie at first intended to follow the track of the Manchurian railway from Port Arthur to the Amur, taking advantage of the sections already completed or in construction; but being obliged to alter his plans, he travelled round to Vladivostok, thence by rail to the Amur at Khabarovsk, and so by steamer up the river to the terminus of the main Siberian line at Stretensk. Good photographic illustrations are given of the British consulate at Newchwang, of the ceremony of cutting the first sod on the Russian-Manchurian line, August 28, 1897, of various scenes on the same, as well as at Port Arthur, Vladivostok, and Khabarovsk; at Stretensk and Blagovechchensk; and on the upper and lower Amur. A large-scale map of Manchuria, based on Russian sources—in default of any good English plan of the whole country—is added at the end of the volume. The execution of this does not strike us as at all on a par, in clearness and legibility, with the amount of accurate information contained. The view of recent events in Manchuria, in chapter ii., and of the earlier history of the Manchurian boundary between China and Russia in chapter v., is accompanied by extracts from various treaties—*e.g.* of 1689, 1858, 1860, 1895, and 1898—and seems free from any of those gross errors so often committed by writers on recent Far Eastern history. A few small mistakes occur, *e.g.* on p. 47, Pi-tzu-wo, on the frontier of the Russian leasehold, is called a village on the *west* coast of the Liao-tung peninsula.

Objection may be taken to some of Mr. Hosie's spelling of Russian names and words; *e.g.* Blagove*sch*ensk (where *sch* is not enough for the *shch* letter), *H*arbin, *H*arbarovsk, and para*h*od (where the *kh* letter is treated rather as if one were to insist on spelling *corf* or *chuff*), and Vladivostock (where the eternal *c* intrudes itself against rhyme and reason). While Mr. Hosie gives (p. 95) a favourable account of the sectional railway between Vladivostok and Khabarovsk, he has many criticisms on the branches of the Russian trunk line in Manchuria and the trans-Baikal region.

C. R. B.

SEEBOHM'S 'BIRDS OF SIBERIA.'

Mr. Henry Seebohm's two works, published in 1880 and 1882, under the titles of 'Siberia in Europe' and 'Siberia in Asia,' have just been re-issued in a single volume, 'The Birds of Siberia: a Record of a Naturalist's Visits to the Valleys of the Petchora and Yenesei' (John Murray, 1901). For ornithologists this work, although docked of the old footnotes on the geographical distribution of birds, etc., must always have a considerable interest; it may be regretted that in the process of condensation the work was not more strictly confined to its scientific side. Mr. Seebohm knew a great deal about birds, but he neither knew nor cared to know more about Russia than the ordinary English traveller. Russia, it might have been remembered, has changed more in the last twenty years than any other European state; and, apart from this, it seems regrettable that an interesting branch of natural history should be made the vehicle for the expression of political or religious opinions.

C. R. B.

AMERICA.

KEANE'S 'CENTRAL AND SOUTH AMERICA.'

Volume I. of 'Central and South America,' by Prof. A. H. Keane, edited by Sir Clements Markham, K.C.B., and published by Mr. Edward Stanford, is a valuable and richly illustrated compendium of the geography of South America. It compresses a great variety of information into a small space, and is a welcome book to any student who desires to gain a general knowledge of the South American states, their ethnological history, present population, orography, river systems, plains, forest areas, climate, flora, fauna, topography, products, and political status. Moreover, it gives a short historical retrospect of each state, including its discovery, conquest, settlement and colonial administration, religion, natural resources, and mineral wealth. It is, therefore, a geography in its broadest sense, well classified and comprehensive. Although, here and there, errors of detail may appear, they are incident to so extensive a subject, where the author has naturally had to depend for much of his data upon numerous travellers and explorers who have, at times, failed in accuracy of observation.

Mr. Keane, in common with other writers, calls attention to the vast areas of Venezuela which remain unexplored, especially the Guayana region. In speaking of the Llanos, he says, "No language could convey a true picture of the varied beauties of the scene—the harmonious effects of light and shade; the blending of the various green, blue, and purple tints flitting in the sunlight over the vast panorama; the stately palms gracefully fanning the glowing atmosphere, with their majestic crowns of broad and shining foliage. . . . Judged by the proportion of urban to

rural population, Venezuela must take rank with the most backward countries of the world; it is still mainly inhabited by scattered rural communities and nomad tribes, with scarcely any large industrial commercial centres."

He gives us an interesting description of the orographic systems of Colombia and Ecuador, and discusses the vexed question of parallel Cordilleras in the latter country. "If the parallel chains have thus to be removed, the sequence of peaks on both sides stands out all the more conspicuously, and constitutes that magnificent 'avenue of volcanoes' which is unrivalled for magnitude and sublimity in the whole world. Here are grouped as many as twenty crests, and a much larger number of peaks, cones, and domes over 15,000 feet high." He also gives considerable data regarding the river system of Perú, especially of the Marañon, Huallaga, and Ucayali, which last-named stream he believes might well be deemed, from "length and volume, to be the true upper course of the Amazon." It resembles in this respect its great rival the Mississippi in relation to its Missouri branch. The Pongo de Manseriche, where the Marañon breaks free from the mountains, is, according to Mr. Keane, 540 feet elevation above sea-level. It seems to have as many elevations as there are travellers and explorers who have visited it. As its height largely governs the slope of the Amazon main river, it may be well to refer to "South America: an Outline of its Physical Geography,"* where the question of the incline of the monarch river is discussed at some length. The author believes that the height of the Pongo de Manseriche above sea-level is not a fourth part of the elevation assigned to it by Mr. Keane, and that the Amazon is not so much a river as it is a gigantic, island-filled reservoir extending from the sea to the base of the Andes, and, in the wet season, varying in width from 5 to 400 miles.

In treating of Bolivia, Mr. Keane justly calls attention to the remarkable lake Titicaca, the drainage basin of which "has an area of over 40,000 square miles; when flooded it must have been the largest lake, as well as the chief reservoir of the largest river in the world." Its shrunken remains now have an area of 3300 square miles. It is probable that, at no very remote geological period, it had two outlets—one southward, through the Argentine provinces of Catamarca, Rioja, and Mendoza, to the Colorado, swelling this river into great proportions, and reaching the Atlantic at the present Bahia Blanca; and a second outlet to the Beni and Amazon, through the La Paz river, which has cut such a profound cañon round the southern base of Mount Illimani.

Chile, which has failed to "attract to its shores a share of the stream of European migration," is treated at considerable length by Mr. Keane, and in bold outline he gives us a most valuable description of the country. No less can be said of the Argentine Republic, Brazil, and the smaller South American states. In fact, the whole work is teeming with

* The *Geographical Journal*, April, 1901.

useful data, so varied that one might wish that some other title had been selected for it. The meaning of the word *geography* has been so expanded of late years, that authors seem to seek its shelter for subjects too remotely related to it and to overtax its too generous hospitality.

It is clear, from the text of Mr. Keane's work, that neither he nor the editor, Sir Clements Markham, could have had anything to do with its numerous accompanying maps, except perhaps the "ethnological" one. An attempt has been made in them to decide for the British Government the boundary-line question between Chile and the Argentine Republic, now *sub judice*. They give to Chile all the territory she claims. It is even more strange to find the limits between Chile and Bolivia treated with the same disrespect of treaties; for, in this case, an entrant angle is thrown into Bolivia, assigning to Chile a large piece of valuable territory, in direct contravention of the truce between those countries of April 4, 1884, and the "Treaty of Peace and Friendship" of May 18, 1895, which followed.

It seems a pity that in so excellent a compendium of South American geography as Mr. Keane has produced, more care has not been exercised to ensure accurate maps.

George Earl Church.

OCEANOGRAPHY.

The "Valdivia" Expedition.

Under the title 'Aus den Tiefen des Weltmeeres,' the firm of Gustav Fischer, of Jena, has published a volume from the pen of Prof. Chun, containing a popular narrative of the oceanographical cruise of the German steamship *Valdivia*, during the years 1898–99. The progress of the expedition during its voyage, and the preliminary results of its work, so far as they have as yet appeared, have been referred to from time to time in the *Journal*, and it is therefore unnecessary to give here a detailed account of the contents of Prof. Chun's book; suffice it to say that the subject falls naturally into three divisions: (1) an account of the outfit and equipment of the expedition; (2) a narrative of the cruise and description of the islands and points visited; and (3) an outline of the deep-sea fauna. The story is told with unfailing interest and charm, lightened every now and then by a touch of real humour; and the wealth of splendid illustrations—6 chromo-lithographs, 8 heliogravures, 32 full-page blocks, 2 maps, and 389 photographs and sketches in the text—make the book almost unique of its kind. The volume should do much to increase the interest taken in deep-sea research in Germany, and so to give the proper stimulus essential for the prosecution of such investigations, which are necessarily national undertakings.

ON SAND-WAVES IN TIDAL CURRENTS.*

By VAUGHAN CORNISH, D.Sc. (Vict.), F.G.S., F.C.S., F.R.G.S., Associate of Owens College.

In continuation of my investigation of the phenomena of waves, I recommenced observations at Barmouth, North Wales, in December, 1899. My attention was soon attracted by the appearance of the sandbanks in the lower portion of the Mawdach estuary, which have the wavy surface shown in Fig. 1 (Plate I.). This photograph was taken on December 31, from an elevation of about 150 feet on the northern shore of the estuary looking south-east, from a position about one furlong above the railway bridge. The time was near low water of a fairly large tide, not yet the full springs, but nearer the springs than the neaps. The highest part of the shoal about halfway across the estuary is stated to be about 9 feet above low water at spring tides which gives about 7·5 feet above the water-line in the photograph. Below the water-line, on the side nearest the camera, the sand, according to the Admiralty chart, slopes down somewhat steeply for a vertical distance of 22·5 feet. At the railway bridge the engineers find in the main channel another 35 feet of sediments overlying the rocky foundation on which they bed the

FIG. 2.—TIDAL SAND-RIDGES, BARMOUTH, BELOW BRIDGE.

iron cylinders. The ridges shown in the photograph are about 18 feet from crest to crest. Fig. 2 is a nearer view of ridges taken from the railway bridge looking west on January 14, 1900, at low water. The troughs between these ridges would only be dry at exceptional tides. The distance from ridge to ridge is about 26 feet, and the height from trough to crest is in some cases as much as 2 feet.

The surface of the shoal is normally in this condition, viz. in ridges ranged across the estuary. The appearance of the surface was quite similar six months later (June 13, 1900), during a second visit to Barmouth. In the interval of six months the sandbanks had shifted a good deal in shape and position, but there was no such striking change in the general appearance of the ridges.

The ridges are not symmetrical, but have a gentle and a steeper slope, the latter a talus of about 31°. In well-developed ridges the summit is not coincident

* Read at the Royal Geographical Society, June 10, 1901.

PLATE I.

FIG. 1. Tidal Sand Ridges at Barmouth.

FIG. 18. Interpenetrating Ridges on the Dun Sands.

with the top of the cliff, but some distance on the weather side, which is slightly concave in its lower and convex in its upper portion.

I was soon able to assure myself that these ridges were caused by the tidal currents, a conclusion which the observations here recorded will show to be inevitable. In 1891, Prof. Osborne Reynolds, F.R.S., had drawn attention to "tidal sand-ripples." He writes *—

"The large tidal sand-ripples below low water in the model estuaries, with the flood and ebb taking the same course, constitute a feature which it is impossible to overlook, yet the existence of corresponding ripples had been entirely overlooked in actual estuaries until they were found to exist when they were looked for, having been first seen in the models. The reason that they were overlooked before is, no doubt, explained by the fact that the bottom is not visible below low-water mark in actual estuaries; but this is not all. In the estuaries these ripples, where found, have been confined to the bottoms and sides of the narrow channels between high sandbanks. . . ."

I had now encountered "tidal sand-ripples" under conditions different from these, and more favourable to detailed examination. I accordingly decided to investigate them further, and to ascertain, among other things, what preserved them from obliteration during the recession of the tide. The localities visited in connection with the work, besides Barmouth (North Wales), were Grange (Lancs.); Findhorn, N.B.; Montrose, N.B.; Mundsley (Norfolk); the Goodwin Sands; Pegwell Bay (Kent); the Severn, between Gloucester and Severn tunnel; and Aberdovey (North Wales).

Observations at Barmouth (North Wales).

December 30, 1899, to January 18, 1900.

The approximate form and extent of the shifting sands of the Mawdach estuary and of the foreshore are shown in Fig. 3, reproduced from the Ordnance Survey Map. Particulars of the tides at the entrance (Ynys y Brawd, south-east point) given on Admiralty Chart 1484 are: H.W.F. and C. $8^h\ 51^m$; sp. rise 14 feet 4 inches: Np. rise 10 feet 4 inches. Np. range 7 feet 4 inches.

The Barmouth boatmen reckon that the tide flows for five hours and ebbs seven hours. The current seems to turn as soon as high water is reached. The maximum velocity in the deep channel under the railway bridge is great, and when the tide is running strongly there are many conspicuous eddies in the estuary. Some views of the tidal sand-ripples have already been given in the introductory paragraphs.

The following measurements were taken on January 9 on the shoal above the railway bridge, shown in Fig. 1 (Plate I.), proceeding up the estuary in a line at right angles to the ridges. The line along which these measurements were taken would have been somewhat less than halfway up the picture in Fig. 1 (Plate I.) (beyond the first lane of water), and parallel with the bottom of the picture. The ridges here had their steeper face up stream—they "face" with the flood tide. The distance from ridge to ridge is called the wave-length (L).

The columns of figures are arranged so as to divide the series into five portions. The average wave-lengths are somewhat greater in the first and last columns, which are near the exit and entry of the shoal. The differences between successive wave-lengths is least where the wave-length is least, near the centre of the shoal.

* 'Third Report of the Committee appointed to investigate the Action of Waves and Currents on the Beds and Foreshores of Estuaries by Means of Working Models.' B.A. Report, 1891, Cardiff Meeting.

Rowing across the main channel, I landed on the next shoal, near to and rather above Coes Faen, and took a second series of measurements at right angles to

FIG. 3.—MAWDACH ESTUARY. SCALE, 1″ = 1 MILE

TABLE I. (Fig. 4).

Forty-five consecutive Wave-lengths.

′ ″	′ ″	′ ″	′ ″	′ ″
16 10	12 0·75	8 1·75	19 2·5	13 9·75
12 7	19 0	14 2·5	19 11	21 3·75
16 2	13 9·5	14 7·75	14 6	18 11·5
22 1·5	20 8	16 2	17 1·5	22 1·75
11 7·5	17 3·5	19 10	22 5·5	21 6·25
20 7	20 8	16 9·5	12 8·5	23 2·5
20 6	14 1·5	16 10	14 10	11 2·5
21 3·5	19 2·5	14 11·5	17 9·5	16 11·75
15 1·5	13 4·5	20 1·5	18 0·25	29 2
average L, 17′ 5″·11	average L, 16′ 8″·25	average L, 15′ 8″ 94	average L, 17′ 4″·75	average L, 19′ 9″·75
average difference between succeeding L's = 28·9 per cent. of average L.	av. diff., etc., = 32·4 per cent.	av. diff., etc., = 17·3 per cent.	av. diff., etc., = 20·9 per cent.	av. diff., etc., = 28·6 per cent.

the ridges, proceeding up stream towards the centre of the shoal until the ridges became irregular. The ridges are nearly parallel with those on the other

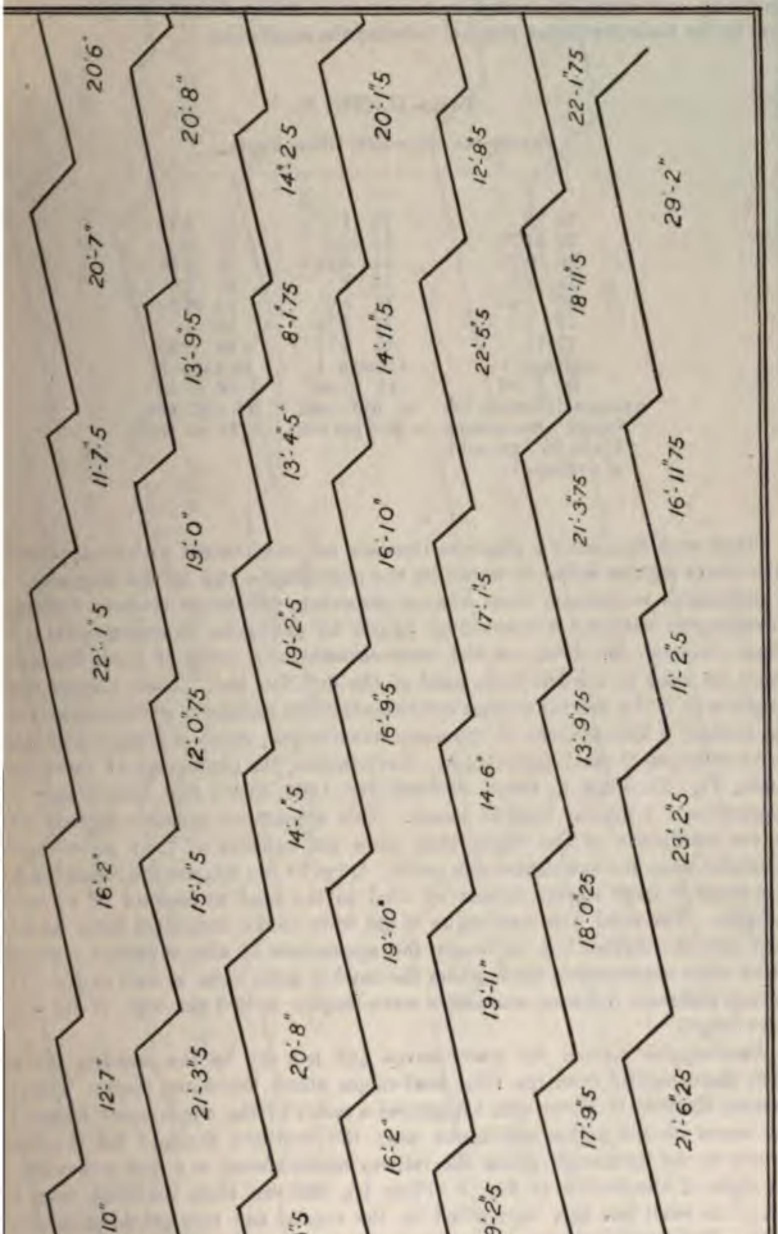


FIG. 4.—MAWDACH ESTUARY, FORTY-FIVE CONSECUTIVE WAVE-LENGTHS. AMPLITUDES NOT MEASURED, BUT DRAWN SO THAT L = 6 H. HORIZONTAL SCALE, 1" = 16'.

sandbank, and must be caused by a motion of water almost at right angles to that in the main low-water channel between the sandbanks.

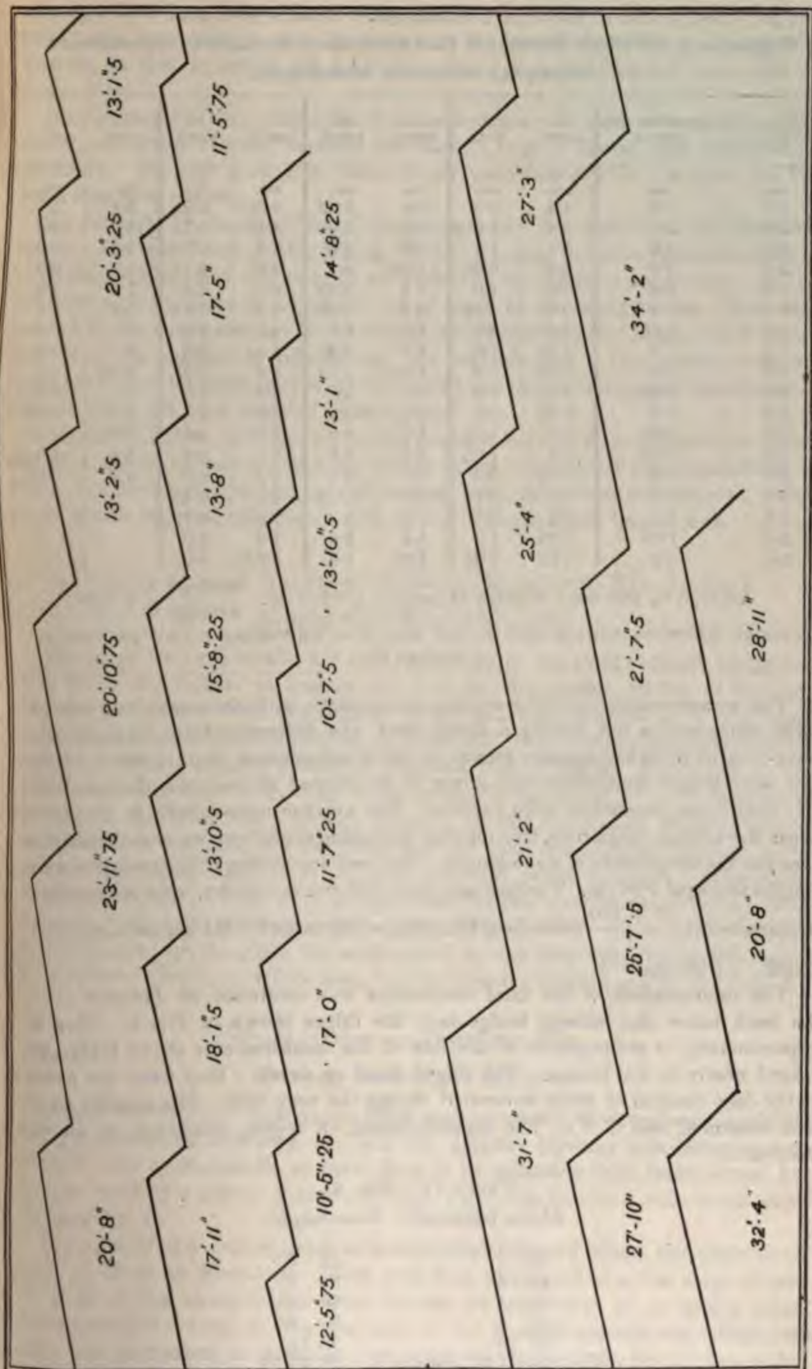
TABLE II. (Fig. 5).

Twenty-one consecutive Wave-lengths.

′	″	′	″	′	″
20	8	18	1·5	10	5·25
23	11·75	13	10·5	17	0
20	10·75	15	8·25	11	7·25
13	2·5	13	8	10	7·5
20	3·25	17	5·0	13	10·5
13	1·5	11	5·75	13	1
17	11	12	5·75	14	8·25
average L, 18′ 6″·96		average L, 15′ 2″·96		average L, 13′ 0″·54	
average difference between succeeding L's = 20·7 per cent. of average L.		av. diff., etc., = 20·5 per cent.		av. diff., etc., = 23 per cent.	

That such figures for a single section are not inconsistent with an appearance as of fairly regular waves is shown by the photographs and by the diagrams. It is instructive to compare these average percentage differences between successive wave-lengths with the corresponding figures for analogous structures. On p. 23, *Geogr. Journal*, Jan. 1900, are the measurements of a series of small dunes produced by wind in the fine loose sand of the dry Nile bed. Their average wave-length is 30′ 5″·75, and the average difference between successive wave-lengths (along one section) is 33·2 per cent. of the mean wave-length, which is greater than in the above examples of tidal sand-ridges. Nevertheless, the photograph of these small dunes, Fig. 21, Plate I., *Geogr. Journal*, Jan. 1900, shows that they present the appearance of a regular train of waves. This appearance probably depends more on the parallelism of the ridges than upon the equality of their wave-lengths, especially when the eye elevation is small. On p. 27, *loc. cit.*, are the measurements of a series of large ripples formed by wind in the sand to leeward of a dune at Ismailia. The wind here had begun to get down to the compacted lower layers of sand, and the ripples had no longer the appearance of almost perfect regularity which often characterizes them where the sand is quite loose as well as dry. The average difference between successive wave-lengths is 42·5 per cent. of the mean wave-length.

Sand-ripples formed by water-waves and left dry by the receding tide are often more regular than the tidal sand-ridges above low-water mark. Thus, on January 8, 1900, at Barmouth, I measured a series of the ripple-mark formed by the waves on the higher sandbanks near the southern shore of the Barmouth estuary in the backwater above the railway embankment, at a spot somewhat to the right of the middle of Fig. 1 (Plate I.), and less than one-third from the top. The swell was here regularized by the regular and very gentle slope of the shore. The measurements commence at the deeper end and proceed shoreward. The ridges are contour-lines on the slope.



FIGS. 5 AND 6 —MAWDACH ESTUARY. HORIZONTAL SCALE, 1" = 16'. AMPLITUDES NOT MEASURED, BUT DRAWN SO THAT L = 6H.

TABLE III.

Ripple-mark, Mawdach Estuary, in Backwater above the Railway Embankment.

Eighty-six consecutive Wave-lengths.

Wave-length (L).	Amplitude (H), approx.	L. contd.	H. contd.	L. contd.	H. contd.	L. contd.	H. contd.	L. contd.	H. contd.
cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.
5·5	1·0	4·4	0·9	5·4	0·95	4·30	0·95	5·4	1·0
5·1	1·0	5·4	1·0	5·3	1·0	4·15	0·75	4·0	0·6
6 1	1·0	5·1	1·1	4·0	0·6	4·1	0·7	2·8	0·6
5·1	1·0	5·2	0·95	4·35	0·7	4·8	0·75	5·9	0·9
5·5	0·9	5·0	1·0	5·5	0·95	6·3	0·9	5·6	1·0
6·0	1·1	5·7	1·25	5·2	1·05	4·9	0·85	5·6	0·8
5·6	0·95	5·85	0·9	5·4	1·1	4·1	0·8	5·1	0·9
5·5	1·0	5·80	1·0	4·8	0·9	4·1	0·9	4·3	0·5
5·0	1·0	5·25	0·8	4·85	0·75	5·4	0·95	3·25	0·5
4·9	0·95	5·15	0·9	4·5	0·8	5·5	1·05	5·1	0·9
5·3	1·1	5·10	0·9	6·1	0·9	5·4	1·1	4·8	0·95
5·4	0·95	5·7	1·05	4·9	0·9	4·95	0·85	5·55	1·15
5·0	0·95	5·2	1·05	3·8	0·9	4·5	0·9	5·6	1·0
5·1	1·0	4·75	0·9	4·1	0·8	5·2	0·9	4·5	0·65
5·1	1·0	4·9	0·75	4·5	1·05	4·9	0·85		
5·5	1·1	4·0	0·8	5·2	0·8	5·0	0·75		
5·6	1·05	5·45	1·0	5·4	1·0	4·8	0·9		
5·0	0·9	5·55	0·95	4·85	1·0	5·35	0·9		

Average L, 5·05 cm.; average H (approx.), 0·913 cm.; $\frac{\text{average L}}{\text{average H}} = 5{\cdot}53$; average difference between each L and that next succeeding = 10·9 per cent. of average L.

The measurements give the average wave-length with accuracy, but, owing to these ripple-marks not having a sharp crest, the difference between consecutive wave-lengths probably appears greater in the measurements than it was in reality. The wave-length diminishes very slowly as we proceed shorewards; the amplitude (H) diminishes somewhat more rapidly. The average wave-length is about 5·53 times the average amplitude, this number increasing slightly as we near the shore, as does also the irregularity of wave-length. The next succeeding 110 consecutive wave-lengths averaged 4·98 cm. The decrease from 5·05 cm. to 4·98 cm. may be considered as spread over $\frac{86 + 110}{2}$ wave-lengths, giving a decrease of 0·014 per cent. per wave-length. [5·08 cm. = 2″.]

The measurement of the tidal sand-ridges was continued on January 11, on the bank below the railway bridge near the ridges shown in Fig. 2. They are approximately in prolongation of the line of the measurements above bridge, and extend nearly to the bridge. The ridges faced up stream; they were the nearest to the deep channel of those uncovered during the neap tide. The greatest amplitude measured was 2′ 2″. The measurements, as before, commence at the seaward end.

TABLE IV. (Fig. 6).

Eleven consecutive Wave-lengths.

′	″	′	″
31	7	21	7·5
21	2	34	2
25	4	32	4
27	3	20	8
27	10	28	11
25	7·5 average L =	26	10·55

Average difference between successive L's = 21·1 per cent. of average L.

Although these large ridges faced with the flood, the little "current-mark" ripples under water faced with the ebb, showing that the last of the ebb is in the opposite direction to that in which the tidal sand-ridges face, but has not been able to reverse them.

On January 16 (spring tide) the tidal sand-ridges were seen on each side of the narrow low-water channel between the island Ynys y Brawd and the town of Barmouth. On the town side these ridges were facing with the flood, on the island side with the ebb.

On January 17 the first "low" (or channel-like depression) on the foreshore opposite the north end of the Marine Parade was seen to be in ridges of about 9′ wave-length, obviously the same in all essentials as the tidal sand-ridges on the sandbanks of the estuary, which are out of reach of the heavy waves. They face parallel to the shore, and not in the direction in which the surf beats, which shows that they are essentially tide-formed, not wave-formed. The waves, however, must have some influence, and what this is will to some extent appear from observations in other localities recorded in this paper.

On the 17th, also, the "lows" on the sandspit beyond Ynys y Brawd, on either side of a perch, or beacon, were all in fine ridges with an estimated amplitude of 1′ 6″. Six days before, at the time of smallest tides, these lows were smooth, which shows that it does not take many tides to create ridges of the largest size.

Observations at Grange-over-Sands (Morecambe Bay, Lancs.).

January 21 to February 4, 1900.

The sands here are almost flat from the shore to the river channel, which has steep sides, and suffices to contain the river for the greater portion of the day. The spring tide comes up the channel as a small bore, followed by a very rapid current, which soon fills the channel to the brim. The waters then spread gently over the extensive flats of somewhat tenacious, clayey, sands. No sooner do the waters reach the shore than they begin to recede again, and are soon confined to the main channel and the tributary brooks. During fairly calm weather, such as we had during my visit, the sandflats show no tidal sand-ridges, although often covered with ripple-mark of various and beautiful patterns, which I cannot deal with in this paper. They show perfect interpenetration of the sand-ridges, simultaneously formed by crossing water-waves. This character of interpenetration is not exhibited to anything like the same extent by the tidal sand-ridges, although it is not entirely absent, as will be seen, *e.g.*, by referring forward to Fig. 18 (Plate I.).

Observations at Findhorn, N.B.

February 26 to March 1, 1900.

During the visit to Findhorn the tides were increasing, the smallest (neap) tide having occurred on February 14, and the greatest (spring) tide being due on March 3. As at Barmouth, so here, there is an extensive tidal basin, which has to empty itself by a narrow channel, through which the tide runs with considerable violence (Fig. 7).

The point of the central shoal is in tidal sand-ridges of about the same wave-length as those at Barmouth. They were only uncovered at a low stage of tide. The parts of the shoal further from the sea are uncovered at an earlier stage. Ridges were also noticed on the west side of the channel opposite the village, and others less permanent in character were seen on the sandspit, dry at low water, which prolongs the promontory on which Findhorn is situated. On this sandspit,

which is exposed both to currents and waves, I noticed on the 26th isolated pools o water left by the partial obliteration of the sand-ridges. Their cross-section is tha of fuljes,* to which they are obviously analogous, a point to which I return late (see p. 182). On the 27th, with a rough sea, the pools were all that was left in othe places where, on the 26th, with calm sea, there had been regular ridge and furrow The shortest tidal sand-ridges had a wave-length of 3′ 6″, the average of thirty

FIG. 7.—FINDHORN BAY. SCALE, 1″ = 1 MILE.

seven consecutive waves. They faced north-north-west, *i.e.* with the ebbing tide. The wind was north-north-east.

Observations at Montrose, N.B.

March 3—17, 1900.

At Montrose, again, there is a broad tidal basin filled and emptied through a narrow channel, which circumstance induced me to visit the place in search of

* See the author, "On the Formation of Sand-dunes," *Geographical Journal*, March, 1897; and "On Desert Sand-dunes bordering the Nile Delta," *Geographical Journal*, January, 1900.

tidal sand-ridges. The tidal conditions are well described in the *North Sea Pilot*, Part ii., 5th edit., 1895, as follows :—

"The great difficulty in Montrose harbour is the strength of the stream, which at times runs at the rate of 6 miles per hour. The time of slackest water in the channel is from just before low water to quarter flood, or perhaps a little later, when the slake is fairly empty. The young flood then setting in, having only to fill the channels in the mud of the slake, is moderate in force. Directly, however, the level of the water

FIG. 8.—MONTROSE BASIN. SCALE, 1″ = 1 MILE.

rises to the general height of the mud in the slake, the stream rushes in with furious velocity. There is little or no slack in the stream at high water, and the ebb runs out with strength to low water. . . . After passing the inner lighthouse the strength of the flood is confined to the south shore, and that of the ebb to the north shore of the harbour. The first of the ebb sets across the Annat sand" (Fig. 8).

Mussels are largely cultivated on the sandbanks of the slake, or tidal basin, to a great extent fixing them, but on the north side of the main channel the sands are being added to by the formation of a new bank on the inner side of the curved low-water channel. This bank is composed of clean sand and shells, free from mussels or weed, and presents a striking appearance from the regularity and large size of the ridges with which it is completely covered. They all face eastward, *i.e.* with

the ebb. The shoal itself rises very gently from the west, and terminates in a steep slope at the swatch-way on the east. Thus there is conformity between the longitudinal section of the ridges and a parallel section through the shoal itself. The ridges are all practically parallel, and they do not face in conformity with the curve of the low-water channel (which is that of the convex low-water margin of the shoal on its southern side), the direction of their facing indicating a bottom current forced towards the centre of the curve, as described by the late Professor James Thomson in his paper upon the "Winding of Rivers in Alluvial Plains."

On this bank, near the main channel, I measured on March 6 a series of ridges (Table V.), of which the first and last are at low-water mark, and north-westerly of this I measured another section (Table VI.), which was found to be almost exactly parallel with the former, and of which the last ridge was about 200 feet north of the first ridge of series V., and almost in continuation of it. The series VI. has a lesser depth of water over it than series V., and is further from the main channel. The last ridge of VI. is not far from the swatch-way dividing this sand-bank from the mussel-bank. The measurements go down-stream, in the direction towards which the ridges face.

TABLE V. (Fig. 9).

Wave-length (L).	Amplitude (H), approx.
′ ″	′ ″
27 0	1 4
24 11	1 4
13 7	1 0·5
17 10	1 1
13 1	0 11
14 10	1 1
18 11	1 3
15 3	1 2·5
18 11	0 9·5
25 11	1 5
av. L = 19′ 0″·3	av. H = 1′ 1″·75 (approx.)

$$\frac{\text{av. L}}{\text{av. H}} = 16{\cdot}6 \text{ (approx.)}$$

av. difference between succeeding L's = 24·9 per cent. of av. L.

TABLE VI. (Fig. 10).

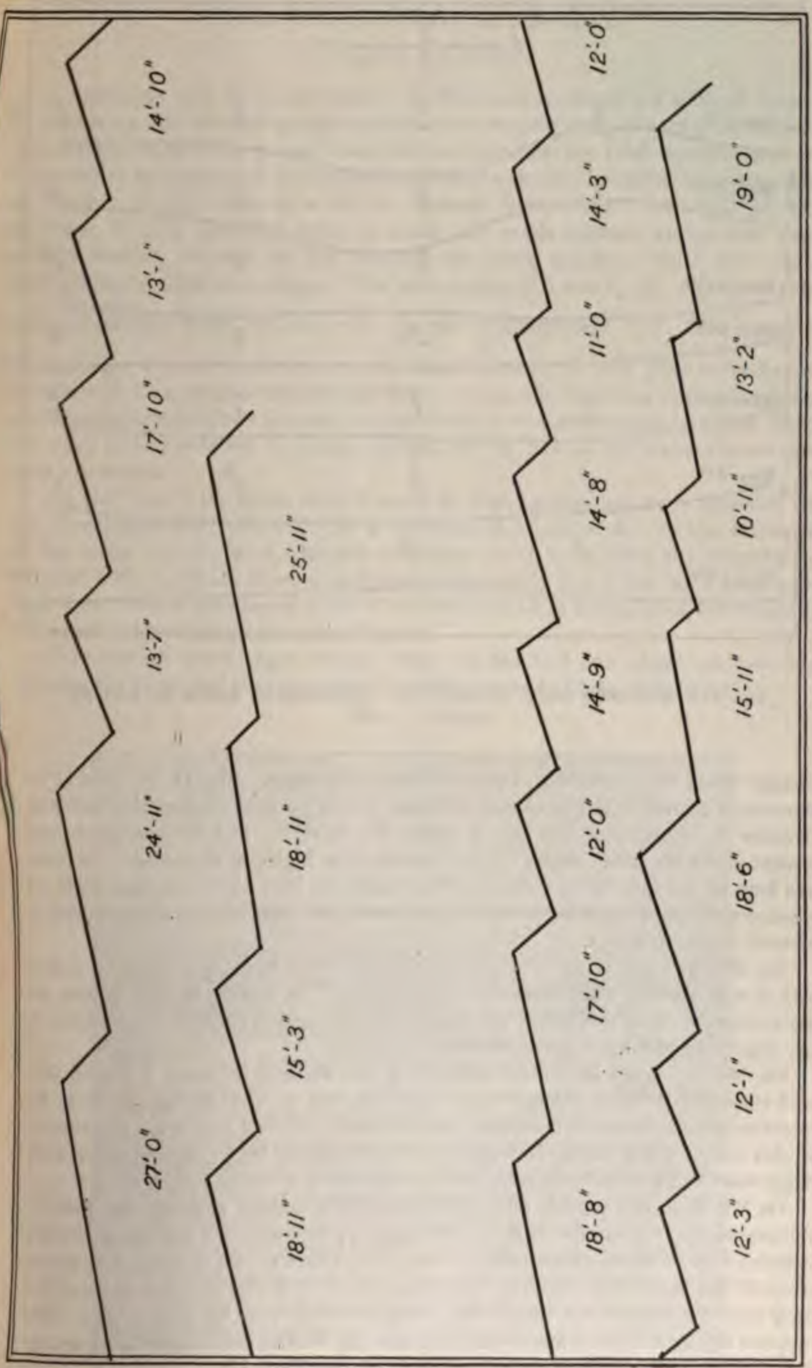
Wave-length (L).	Amplitude (H), approx.
′ ″	′ ″
18 8	1 1
17 10	1 1
12 0	0 11
14 9	0 10·5
14 8	1 1
11 0	1 0
14 3	0 10
12 0	0 10·5
12 3	0 11·5
12 1	1 1·5
18 6	1 6
15 11	0 9·5
10 11	0 10
13 2	0 8
19 0	1 2
av. L = 13′ 2″·4	av. H = 11″·83 (approx.)

$$\frac{\text{av. L}}{\text{av. H}} = 13{\cdot}39 \text{ (approx.)}$$

av. difference between succeeding L's = 22·3 per cent. of av. L.

The first and last ridge of the V. series were marked by stakes. On the following day, March 7, the first ridge of the series had moved forward (*i.e.* to the east, in the direction in which the ridges faced) 30″·5, and the last ridge of the series had moved forward 31″. Of the VI. series one ridge marked by a stake had in the same time moved 24″ to the east. On the next following day, March 8, three stake-marked ridges of the VI. series had moved 25″, 25″·5, and 27″·5 respectively. During the three days March 6—8 inclusive, with a diminishing range of tide, the average amplitude of the ridges of V. series decreased appreciably, but the wave-length remained practically constant.

On March 12, with a strong westerly gale blowing, the ridges were much more sinuous, and many pools of water remained at low tide owing to dams across the



FIGS. 9 AND 10.—MONTROSE BASIN. HORIZONTAL SCALE, 1" = 16'. VERTICAL SCALE = 3 × HORIZONTAL.

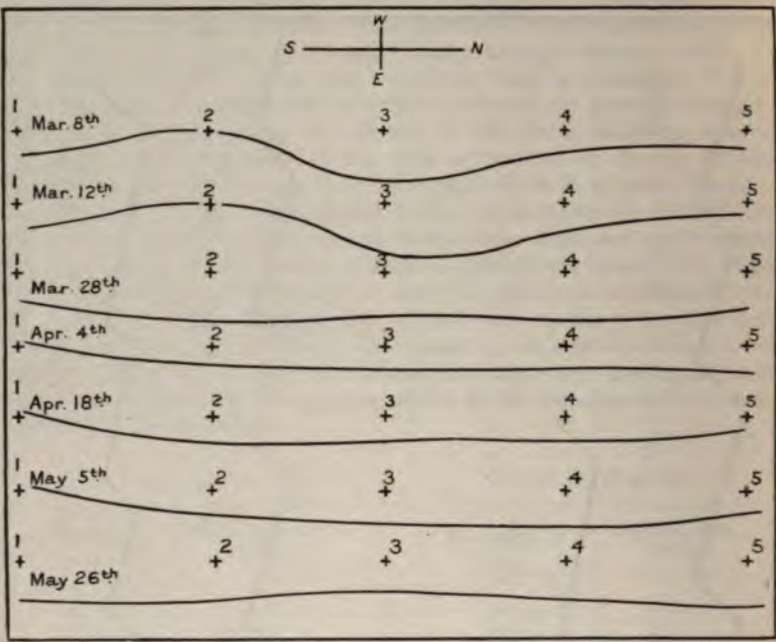


FIG. 11.—MONTROSE BASIN. POSITION OF WAVE-FRONTS, MARCH 8—MAY 26. SCALE, 1″ = 32′.

troughs where sand had been washed in from the ridges. Fig. 11 is a plan of the wave-front nearest to the cross-row of stakes, which I put to connect the beginning of series V. (south) and the end of series VI. (north). The measurements were continued for me after March 12 by Captain John Inglis of Montrose. No record was kept of the number of ridges which passed the line. The diagram shows the constancy of the orientation of the ridges nearest the cross row of stakes during an interval of eleven weeks.

On March 7 I examined the bank to the north of the rippled shoal. A great part of it is covered with mussels or with weed. The surface is very uneven, and the vertical inequality is about the same as on the rippled shoal, without, however, any regularity of form or arrangement.

On March 13, on the foreshore north of the harbour entrance, I noticed tidal sand-ridges in a "low" along which the tide was ebbing strongly. From the conformation of the sands it seemed unlikely that the flood tide could run strongly up this low in the opposite direction, and it seemed probable, therefore, that these ridges were being formed without the co-operation of a return current.

On March 17, spring tide and a good deal of wind, the receding tide partially obliterated the tidal sand-ridges on the foreshore, leaving pools analogous to fuljes, of which Fig. 12 shows characteristic examples. Those shown in the photograph are about 15 feet from right to left. The steep face is on the right. The chain of four pools has been formed in a single long trough to the left of the former ridge. This supports my idea that in the deserts a lateral (as well as the longitudinal) connection may be traced between neighbouring fuljes (see Plate I.).

Observations at Mundsley, Norfolk.

April 14–17, 1900.

I decided to visit the north coast of Norfolk in order to see the effect of the sea in producing tidal sand-ridges where there is no neighbouring estuary or tidal river, and where, owing to the general trend of the coast-line, the tidal currents may be expected to be strong and to run parallel with the shore. I selected Mundsley, east of Cromer, on the suggestion of Mr. Clement Reid, F.R.S. On April 15 and morning of 16th, with the wind off shore, the sands exposed at low tide were mostly smooth, only in the low between the beach and the "ball" were there well-preserved tidal sand-ridges. The wave-length (L) was 4′ 10″, average of thirteen consecutive waves, and the ratio $\frac{L}{H}$ was approximately 16·7. The crests of these ridges were at right angles to the shore, whereas if they were wave-formed they would be nearly parallel to the shore. Probably, however, wave-disturbance under suitable conditions induces the formation of tidal sand-ridges in places where the tides alone would not be strong enough, for the jerk of the waves throws sand into suspension.

On the "ball" the much-blurred traces of tidal sand-ridges were measured on the morning of April 16, and had a wave-length of about 4′. In the afternoon of the same day the wind changed, and blew along shore from the direction of Cromer with moderate force, and breakers apparently 3 to 4 feet high came in at high tide. In the morning of April 17 the ball was all in conspicuous but irregular tidal sand-ridges facing eastwards (Fig. 13).

The average wave-length of six ridges on the ball was about 19 feet, but appearances suggested that some of the smaller ridges had been obliterated.

FIG. 13.—THE "BALL" AT MUNDSLEY, NORFOLK.

FIG. 14.—A "LOW" AT MUNDSLEY, NORFOLK.

In the low the average wave-length of nine consecutive ripples was about 11′ 6″ (Fig. 14). There has been no increase in the calculated tides since the 15th, and the greatly increased dimensions of the ripples must therefore be attributed to the action of the wind upon the water.

OBSERVATIONS ON THE SEVERN SHOALS,
April 26 to April 30, 1900.

The first place selected for observations was Severn Bridge, a little above Sharpness, the entrance to the Berkeley and Gloucester canal. Above this the river has a steep gradient to beyond Newnham, and is much encumbered by sandbanks. Ordinary spring tides at Sharpness rise 27 feet, and neaps 15 feet.* The general character of the spring tides between Severn Bridge and Newnham is as follows. The flood commences with almost absolute suddenness, as a violent rush of water, which however, at Severn Bridge itself, does not usually assume the form of a bore. The whole rise of level is accomplished in a remarkably short time; the current, however, does not turn when subsidence begins, but continues to flow up stream gently and quietly. When the seaward current commences, therefore, the water is no longer deep over the sandbanks. Just above Severn Bridge is a broad sandbank marked "Waveridge sand" on the Ordnance Survey Map, but locally known as "Waifridge." During my visit this sand was practically smooth (though showing current-mark), except at the tip near the bridge, where there were some tidal sand-ridges facing with the ebb. There is comparatively quiet water here before they are uncovered. The sandbanks between here and Newnham are all (as far as I have seen them) similar in character.

The main channel of the ebb is close to the western shore, from which the

* 'Sailing Directions for the West Coast of England,' 4th edit., 1891.

currents can be readily observed. The rush of the flood over the "Waifridge" is best seen from the commanding elevation of the bridge, 100 feet above low-water mark. I watched this on April 27, two days before the highest of this set of spring tides. The rush of water under the bridge is terrific. I was told by the custodian of the bridge that 10 knots has been actually measured there, and that at exceptional spring tides the speed must be greater. The flood does not force its way up the main low-water channel, but swings out to the east, works up a swatch-way on that side of the point of the "Waifridge," and subsequently sets strongly across the sands towards the main channel and the western shore. As the water rushed over the sands, the spurting of the imprisoned air presented quite a remarkable appearance. Such a rush of water over nearly dry sands is incompatible with the formation or preservation of large ridges. The sand would slide in bulk from crest to trough.

On the following morning (April 28) at 8.45 a.m. the tide was ebbing gently and quietly over the Waifridge, but at 9.15 a.m. was rushing over it in waves and with the sound of surf. This, and perhaps the existence of cross-currents, explains why the ebb does not leave the sands in ridges. Leaving Severn Bridge by boat at 10 a.m., I dropped down with the tide past many sandbanks, which, as far as could be seen from the boat, were mostly smooth, until I reached at 12.10 p.m. the Dun Sands below the junction of the Wye and Severn (Fig. 15). I had been

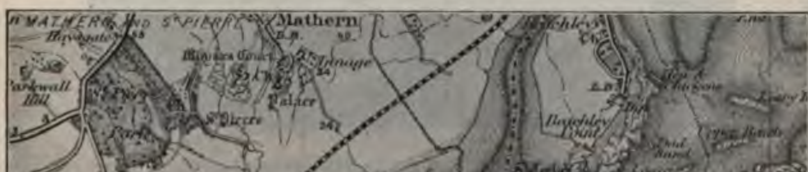


FIG. 15.—THE DUN SANDS. SCALE, 1″ = 1 MILE.

informed at Severn Bridge that this shoal, unlike most of the other sandbanks, was normally in ridges. I found it to be so on this occasion, and was struck by the

FIG. 16.—RIDGES ON THE DUN SANDS, RIVER SEVERN, LOOKING EAST.

total contrast between its appearance and that of the other shoals I had seen in the Severn. Fig. 16 is a view looking east from the highest point of the sands, which

TABLE VII. (Fig. 17).

Fifteen consecutive Waves.

Wave-length.	Approximate amplitude.
′ ″	′ ″
38 11	2 0·5
54 0	1 4
38 0	1 6·5
45 7	2 0·75
46 7	1 11
29 7	1 8
37 5·5	1 2
52 0	2 9
32 10	2 6·5
44 8	1 7·5
36 0	1 9
35 2	1 2·5
22 4·5	2 9·5
23 0	1 2·5
29 5·5	2 1
average L = 37′ 8″·5	average H = 1′ 11″·22

Average difference of succeeding L's = 26·4 per cent. of the average L.

$$\frac{\text{average L}}{\text{average H}} = 19{\cdot}49 \text{ (approx.)}$$

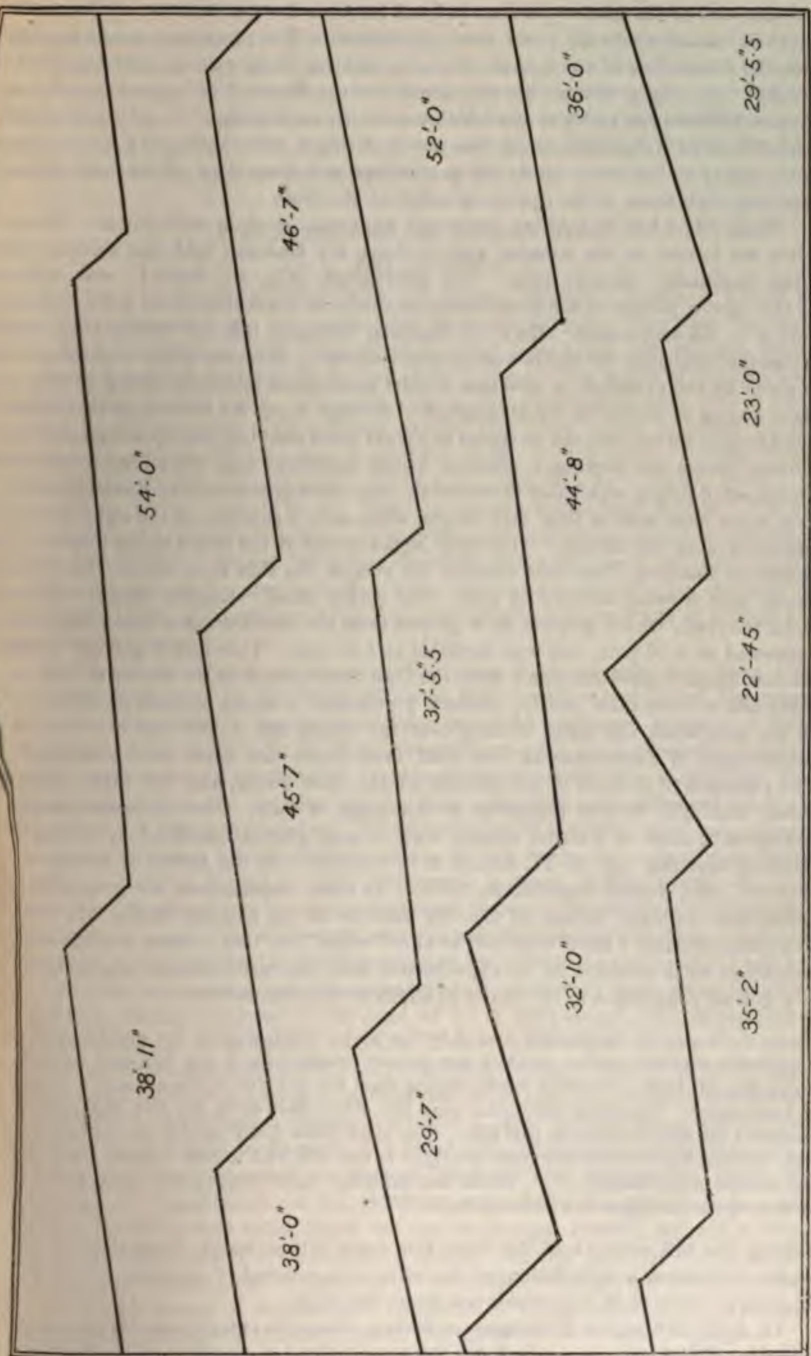


FIG. 17.—DUN SANDS, RIVER SEVERN. HORIZONTAL SCALE, 1" = 16'. VERTICAL SCALE = 3 × HORIZONTAL.

is south-west of the narrow portion, and not far from the western side. The man's figure is distant about 25 yards from the camera. The preceding measurements give the dimensions of the largest ridges, proceeding from east to west (approximately), the ridges facing this way towards "the Shoots," or narrow low-water channel between two rocky shoals which are shown on the map. There is a gradual rise of level as we proceed along this group of ridges, terminating in a steep slope down nearly to low-water mark, the gentle slope and steep slope of the shoal corresponding with those of the ripples, as noted at Montrose.

These ridges had undulating crests and somewhat sinuous wave-fronts. Many pools are formed in the troughs, and in these, my boatman told me, salmon are often impounded between tides. The photograph (Fig. 18, Plate I.) was taken at the narrow portion of the shoal where the sands are lower than those to the north-east or to the south-west. Here, my boatman informed me, the ebbing tide runs across the shoal after the south-west portion uncovers. Evidence of this cross-current is given by the existence of two sets of tidal sand-ridges interpenetrating nearly at right angles, as shown on the photograph. A ridge of one set starts near the right-hand bottom corner, and can be traced to a point more than halfway up and more than halfway across the picture, a distance which comprises four wave-lengths of the second set of ridges, which face the camera. This wave-characteristic of interpenetration is not often seen in tidal sand-ridges, whereas it is common in the wave-formed ripple-mark of the strand. The water began to rise at the sands about 2 p.m. I crossed to Beachley Point and watched the rise of the tide from there. The Dun Sands were covered about 3.45 p.m. The rocky shoal "English Stones" lower down the river, which projects as a groyne from the south-eastern shore, was still uncovered at 4.10 p.m., but was invisible at 4.50 p.m. This rocky groyne, which reaches nearer high-water mark than the Dun Sands, must cause the water both to cover and to leave them gently, without preventing a strong current, at all events on the ebb, when the water is deep over the sands, and I infer that it is by this combination of circumstances the tidal sand-ridges are made and maintained. The existence of a shoal in the position of the Dun Sands, and the shape of the shoal, must also be due primarily to this ledge of rock. The circumstances are analogous to those of a model estuary with a large groyne described by Professor Osborne Reynolds (pp. 16–17, Report of Committee 'On the Action of Waves and Currents, etc.,' British Association, 1891). In these experiments the groyne projected from the right instead of the left bank as do the English Stones. In order to avoid confusion, I have ventured to alter "right" to "left," when the following account of what occurred in the experiments with the model estuary may be taken as a general description of the course of affairs at the Dun Sands:—

". . . It was the large eddy caused by the groin which caused the greatest effect. The water entering on the right of the estuary crossed over to the left, and returned along the left bank. In other words, during flood the left side of the estuary . . . was in back-water. This back-water also gave the ebb a start down the left bank, which rendered the ebb stronger on this side. The sand came down rapidly on the left side, and, besides, was carried over from the right to the left, and formed a bank along the left middle of the estuary. . . . Round this bank the water circulated, carrying the sand with it up on the right and down on the left."

During the full strength of the flood, the same author states, projections of the banks only cause a retardation of the rate, not a reversal of the direction, of the current, in the area of that which one terms the eddy.

On April 29 I was at Newnham-on-Severn, where the extensive sands are mostly smooth. There were, however, a few tidal sand-ridges of no great regularity above the landing-stage in a position where there is an eddy on the ebb, and which is

also protected from the violence of the first of the flood. In the evening I watched the bore discharge an oblique breaker over the sands of the eastern shore, and this was immediately followed by a current of great speed, slackening later on when the depth is greater. It continues to run up, as has been already stated, while the level of the water is falling. The conditions here are the opposite of those at the Dun Sands, but similar to those just above Severn Bridge.

Observations on the Goodwin Sands.

May 12, 1900.

On May 12, in fine weather, with a light north-easterly breeze, I landed on the North Goodwin, near the north-west buoy, at 4.20 p.m. The date was half-way between those of neap (May 8) and spring tides (May 16), but the height of tide approached more nearly to that of the springs. The winds of late had been variable and mostly light. The following is the wind-record from May 1 to 12 posted at Ramsgate by the harbour-master, the force being indicated by the numbers 0–12: 1st, W., 2; 2nd, S., 2; 3rd, S.W., 6; 4th, S.W., 5; 5th, S., 3; 6th, E.N.E., 2; 7th, S.W., 2; 8th, N. by E., 3; 9th, W., 3; 10th, N. by W., 3; 11th, E. by N., 3; 12th, N.E., 2. The tidal current in the Gull Stream, *i.e.* along the western shore of the North Goodwin, runs north-east from about two and a half hours before high water at Ramsgate for about seven hours, *i.e.* until four and a half hours after high water, and then turns and runs in the contrary direction for about five hours, these streams having an average rate of three knots at springs and two knots at neaps.*

At the time of my visit to the Goodwins, these currents can have been very little influenced by the winds, but such wind as there was caused the waves to traverse the sands in the opposite direction to the north-east stream. I found most parts of the sands to be in ridges, except the sloping shore exposed to breakers on the north-west and north-east. In exposed positions the tidal sand-ridges were a good deal blurred and rounded, and in some cases only pools remained below the general level of a smoothed surface. In positions open to the south-west, but sheltered from the north-east by the higher portions of the bank, the ridges were better preserved (Fig. 19, Plate I.). The photograph is taken looking south: the tidal sand-ridges face the camera; the current mark, showing the direction of the current just before the sands were uncovered, faces in a south-and-east direction. Bordering on a shallow bay, sheltered from the north-east, but open to the south-west, I saw two orders of tidal sand-ridges facing the same way (viz. northerly), major ridges (of which three in succession measured 66′, 88′, and 64′ 6″ in wave-length, with amplitudes of approximately 22″) and smaller ridges on their weather slopes of about 15′ wave-length, which was the ordinary size of the tidal sand-ridges. The colour of the larger ridges was, I think, of a different tone from that of the smaller. Further observations on similar ridges were made subsequently (see p. 193). In the time at my disposal, I covered about a mile of the sands, and found that everywhere the tidal sand-ridges faced in a northerly direction, *i.e.* against the light wind and against the waves, which are not insignificant on the Goodwins even when the wind is light. It is evident, therefore, that these ridges are due to the tidal current, and not to waves —a point about which I wished to be certain, because the sand-ridges on the Goodwins have been cited by more than one author as an example of the supposed maximum dimension of wave-formed ripple-mark. These citations originate from the following passage in a little work on lifeboat-work on the Goodwins †:—

* *Vide* King's 'Pilots' Handbook for the English Channel,' 12th edit., p. 143.

† 'Storm Warriors,' by the Rev. John Gilmore, M.A., pp. 108, 109.

"On the Goodwins, where the force of the sea is in every way multiplied, and the waves break and the tide rushes with tenfold power, the little sand-ripples of the smoother shore become ridges of two or three feet high. It is on these ridges that the lifeboat so continually grounds."

I infer from my observations that it is the ridges facing with the current, not the wave-formed ripple-mark, which have a reputed height of 2 or 3 feet.

We have next to consider why the exposed tidal sand-ridges at the time of my visit were facing with the flowing tide and not with the succeeding ebb, though the wind favoured the latter. Observation from Ramsgate on May 11, 12, and 13, showed that the higher (north-east) portions of the north Goodwin were covered and uncovered about 3½ hours before and after high water. As the south-west-going current (unless influenced by wind) does not commence until 4½ hours after high water, it follows that during this current the sands are partly bare, and that those which are under water are sheltered by the uncovered part on the north-east, and are presumably in a back-water or "eddy tide." The whole of the sands, on the contrary (except the short and comparatively steep slope on the north-east of the summit), are fully exposed to the north-east-going flood current, and therefore face this way. Here, again, the gentle and steep faces of the tidal sand-ridges correspond with the gentle and steep slopes of the shoal itself. Probably a strong northerly wind would reverse the ridges for a time.

Observations in Pegwell Bay.

May 14, 1900.

On May 13, the wind blew with a force 4 of the scale 0–12 from north-east by east, increasing in the night, and on the morning of the 14th, to force 6 from east-north-east. In the afternoon I visited Pegwell Bay. There had been a strong current setting into the bay in the morning, and the flats of sticky sand, exposed at low water, were covered with tidal sand-ridges of about 8′ wave-length and 3″ amplitude. These, however, were so irregular that they might not be recognized for what they are by an unaccustomed eye. In calm weather, I am informed, these sands are smooth except for the ordinary small ripple-mark. This observation shows that the "tidal" sand-ridges can be formed by a drift of water caused by the wind setting into a bay.

Observations in the Dovey Estuary, North Wales.

May 31 to June 20, 1900.

The deep tidal channel of the river Dovey now clings for the most part to the northern shore of the wide valley, a long spit of sand and shingle having grown out from the southern side. On the south-west is the longest stretch of open sea, where the wind has most power over the water both in respect of creating waves and causing currents* (Fig. 20). As in the case of the Barmouth and Montrose estuaries, therefore, the spit of drifted materials has grown from the exposed side, and, under its shelter, the estuary has partly silted up. These estuaries may be called D-shaped. Down the straight stroke of the D runs the scouring ebb current; the silting current of the flood swings round the bow of the D. Prof. Osborne Reynolds has pointed out this effect of dissymmetry in the boundaries of an estuary. I now draw attention to the production of dissymmetry by littoral drift from the

* The author on "Sea Beaches," etc., *Geographical Journal*, May and June, 1898.

side exposed to the longest stretch of sea, and to the fact that the rivers have been pushed to their furthest possible limit, against hills of resistent rock.

The following is a general account of the distribution of the tidal sand-ridges above low-water mark in this estuary. From the high hills on the north shore they are spread out as a map, and they are, in fact, a most valuable map of the tidal currents. Generally speaking, the sandbanks have a very gentle slope and a fairly steep one, the latter usually on the outside of the curve of a low-water channel. On these steeper slopes the ridges face with the ebb, on the broader,

FIG. 20.—DOVEY ESTUARY. SCALE, 1″ = 1 MILE.

flatter portions they face with the flood. The tendency of the flood current to take the shorter course across the banks, and of the strong ebb currents to follow a winding path, is very noticeable. The wave-fronts of the ebb-facing ridges are generally more sinuous than those of the flood; they suggest formation when the waters are running together as the banks dry out. The ebb-facing ridges seem also to be, as a rule, at a lower level than those which face with the flood. Symmetrical ridges with both faces sloping at about 12° are very rare above low-water mark; generally the slower reverse current appears to have no effect upon the *form* of the ridges as seen at low water, even in the case where, as I proved by observation from an anchored boat, the slower, in this case ebb, current followed the same path as the stronger, flood, current, in the reverse direction. It is to be noticed that the

ridges are larger than the size proper to the return current. There are, at least, two processes which might conceivably go on when a gentler current flows over, without reversing, or even turning, the top of the ridges: one is, cutting back the steep face; the other is, building it out. Both processes go in on snow-ripples,* but I cannot yet say if either occur in the case of the tidal sand-ridges.

The most interesting views of the sands are those from the wooded hill north-east of Trefri (above the last letter of that word on the map). Fig. 21 is from a photograph taken at an elevation of about 300 feet looking south-west by south (see Plate II.). The small rocky promontory of Trefri is on the right. Outside this promontory is a shoal with strong ridges facing with the flood (easterly, to the left); nearer is a small shoal with the ridges facing westerly with the ebb. It appears, from the configuration of the banks, that this small shoal, sheltered from the west, whence comes the flood, is exposed to a west-flowing ebb on the outer side of the bend of a minor channel shown in the photograph. The rocky promontory appears to deflect the flood so as to protect the ebb-made ridges from swift currents flowing in the reverse direction. Fig. 22 (see Plate II.) is from a photograph taken from the top of the same hill, at an altitude of 500 feet, looking south-south-west across the great semicircular shoal round which sweeps the main channel. The most marked feature is the regular series of straight ridges facing with the flood, which indicate that when the sandbank is submerged, the flood

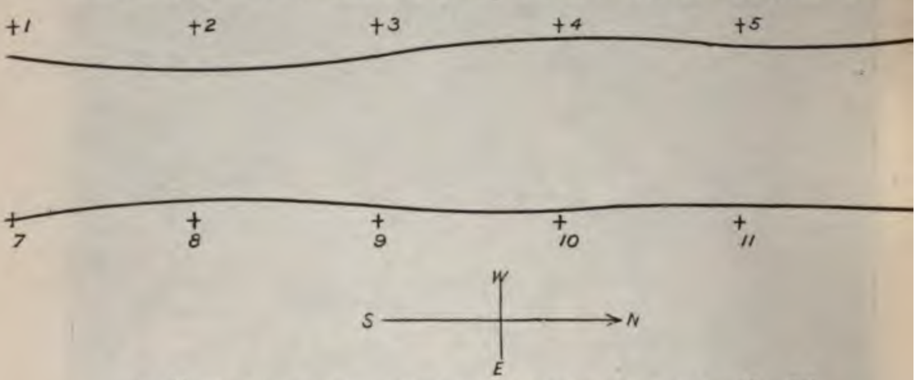


FIG. 23.—DOVEY ESTUARY. PLAN OF TWO WAVE-FRONTS. SCALE, 1″ = 32′.

flows swiftly and uniformly in a broad sheet of water, taking a short cut across the bend.

Fig. 23 is a plan of the wave-front of a part of two of these ridges exactly measured by means of stakes put in at distances of 30 feet in each row, with 22 feet between the rows. The ridges were well defined still further south, beyond the stakes.

The bend which the main channel now takes is greater than is shown upon the map. The increase of the shoal accompanying this retreat of the main channel does not appear to take place by the simple process of accretion on the convex shore near the apex, but, as well as I could judge, by the formation of crescentic outliers beyond the apex of the bend—banks conforming to the shape of the shoal, but separated from it by shallow channels, which are afterwards filled in, so that the outlier becomes part of the main shoal.

* "On Snow-ripples." Abstract of paper by the author read at Section E, British Association, 1900. See Report Bradford Meeting.

PLATE II.

FIG. 21. Dovey Estuary, looking S.W. by S.

FIG. 24. Ridges of Sand and Shells, Dovey Estuary.

FIG. 26. An "Experimental Plot," Dovey Estuary.

Observation of the Form of the Ridges where the Sand is mixed with Coarser Materials.

On one of the shoals the sand is mixed with stones and cockle-shells. Fig. 24 (see Plate II.) is a photograph of the ridges here. The leeward portions (right hand) consist of sand which has been picked out from among the coarser materials, held floating for a time in "eddying suspension," and finally deposited on the lee of the ridge. The weather side of the ridges, now faced with shingle and cockle-shells (left hand), assumes a slope almost as steep as the talus of the lee side, because the coarser material does not slide so readily as the finer sand would do under like conditions.

Observation of the Effect of a Supposed "Setting" of the Sand.

South-west of the experimental plot, among ridges facing with the flood, were some of considerable amplitude, which differed not only by their size, but

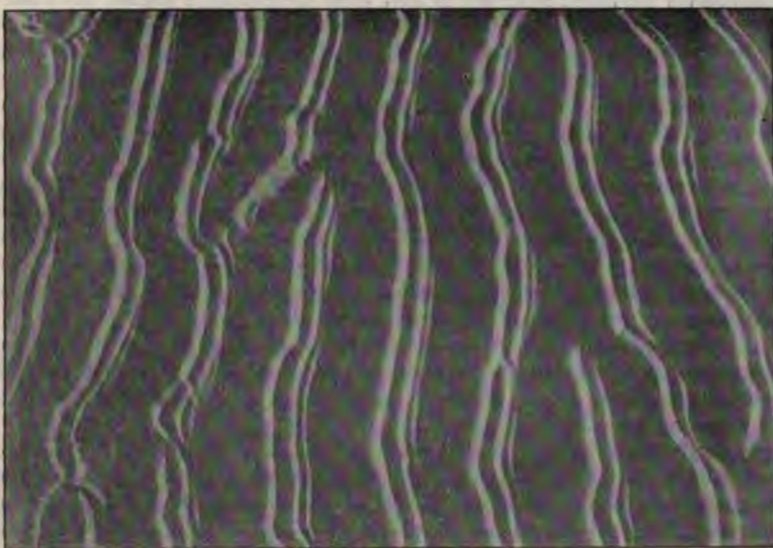


FIG. 25.—WAVE-FORMED RIPPLE-MARK WITH TRIPLE CRESTS, GRANGE, LANCS.

by the tone of colour, from the ordinary ridges. They reminded me of the larger order of ridges noticed on the Goodwins. I marked the crest and trough of one of these ridges by stakes. On June 4, after two days, I found that the ridge had not moved, although those on the experimental plot had travelled freely. I thought this might be due to lateral scour on the ebb, of which there was some evidence. On June 12 I noted that the big ridge had not moved, but a minor ridge in continuation of it had moved. I also have a note that the sands hereabouts are not so firm now as during the smaller tides. On June 15, when the tides were large, I took a photograph, which appears to show the building out of a new ridge under the shelter of the old one. This suggests that the stationary character noted on June 4 was due, not to the ebb undoing the work of the flow, but to actual immobility of the material of which the ridge is composed. On June 20, tides falling off, I have a note saying, "I think it is a case of building out in the shelter of the old ridge, 'a double crest,' in fact, as we get with (ordinary) ripple-

mark." On the whole, it seems that among the tidal sand-ridges which are exposed at low water, a *setting** of the sand sometimes occurs, and that this modifies the behaviour of the ridges in a marked manner. Probably the same occurrence accounts for the multiple crests sometimes seen in wave-formed ripple-mark (such as those of the preceding figure, Fig. 25). This example is from Grange, Lancs., where the sands, which are admixed with clay, are exposed to the air for many hours between tides, and have then sufficient coherence to yield a vertical section for measurement, and to admit of slices being removed on a spade for the purpose of being modelled in plaster. I propose to make further observations on the effect of *setting* upon the forms of ripple-mark and other sand-waves.

Measurements on an Experimental Plot.

On the sandbank Traeth Malgwyn, at a spot bearing south from the north end of Aberdovey pier, and north-east by east from the Refuge, I pegged out what I may term an experimental plot. Twenty stakes were driven firmly into the sand to a depth of about 3 feet. There were five transverse rows of stakes, 15 feet from row to row, and in each transverse row, parallel to the ridges, the distance from stake to stake was 20 feet. This gave a square plot of 60 feet side, permitting of the exact measurement of the position of five wave-fronts along four sections. Strings stretched from stake to stake at the two sides of the plot served as datum lines, and enabled amplitude to be taken with tolerable accuracy along two sections. The ridges here face south-westerly with the ebb. They are not parallel to contour-lines (as swell-formed ripple-mark of the strand usually is), but, on the contrary, are on a noticeable slope, so that the troughs act as channels for the last runnings of the ebb, which thus escape to the north, *i.e.* in a direction at right angles to that of the current which produces the ridges.

Fig. 26 (see Plate II.) is from a photograph taken on June 17, a view looking south, which includes the two first of the five cross-rows of stakes. At this date there had been several successive spring tides of ordinary height, and the ridges were well developed.

In the following table of measurements, I record for each day the depth of water on Old Dock Sill, Liverpool (from Jefferson's Isle of Man Almanac), for the tide previous to each observation. This shows the progress of tides from neaps to springs. The depths of water on the plot are not very far from one-half of these values.

An examination of this table shows, among other things, that, here, towards neap tides the ridges facing with ebb are smoothed out, and that the sands here remain almost featureless, but that, as the tides increase, well-defined steep ridges appear, which grow in height, and also, apparently by elimination of certain ridges, in average wave-length. As the tides fall off again the height or amplitude of the ridges rapidly decreases, the wave-length decreasing very slowly. Thus, from June 2 to June 5 the amplitude diminished 42 per cent., while the wave-length diminished only 2 per cent. During this diminution of amplitude there was no appreciable change in the general level of the sand surface. It will be noticed that the course of affairs during increasing and diminishing tides recalls what happens with waves at sea, where we have a short steep sea in a rising storm,

* Cp. Osborne Reynolds, 'Second Report of Committee on the Action of Waves and Currents, etc.,' p. 14, B.A. Report of Leeds Meeting, 1890; and G. H. Darwin, "On the Horizontal Thrust of a Mass of Sand," *Min. Proc. Inst. C.E.*, vol. lxxi. (1883), pp. 350–378

TABLE VIII.

Measurements of Experimental Plot, Dovey Estuary.

Date.	Depths on Old Dock Sill, Liverpool.	Wind.	Average amplitude (H).	Average wave-length (L).	$\frac{L}{H}$	Average daily advance of ridges.	Remarks.
June 1 … …	17′ 5″ (a.m.)	easterly	—	14′ 3″·7	—	—	Depth, Liverpool, on May 29, 18′ 8″; May 30, 18′ 5″; May 31, 18′ 3″.
,, 2 … …	16′ 3″ ,,	,,	6″ 34	13′ 10″·4	26·2	3′ 2″·1	Mean surface level, taking the ridge to be a rectilinear wedge, 4″·2 below the datum line.
,, 3 … …	15′ 2″ ,,	,,	5″·33	13′ 7″·25	30·6	2′ 5″·75	Mean surface level, 4″·3 below the datum line.
,, 4 … …	14′ 2″ ,,	,, (fresh)	3″ 94	13′ 6″	41·1	1′ 6″·6	Mean surface level, 3″·8 below the datum line.
,, 5 … …	13′ 6″ ,,	,,	3″·71	13′ 6″·6	43·8	0′ 1″·4	Mean surface level, 3″·91, *i.e.* no perceptible change since June 1. The advance of ridges had almost ceased, quite suddenly, as if the tide current had fallen below a critical velocity.
,, 6 … …	12′ 10″ ,,	south-westerly	—	13′ 5″·8	—	2″·9 (one tide)	
,, 7 … …	12′ 10″ ,,	south-westerly (fresh)	—	13′ 4″·5 (approx.)	—	—	The lee cliff has vanished; measurements for length therefore difficult. The troughs show ripple-mark due to wind-raised waves perpendicular to the ridges, and there is "current mark" facing with the flood.
,, 8 … …	13′ 1″ ,,	westerly (fresh)	—	—	—	—	The old ridges still visible as gentle swells, but crossed diagonally by a "swell" from south-west, which is more conspicuous.
,, 9 … …	13′ 8″ ,,	—	—	—	—	—	No observations of the plot to-day (9th).
,, 10 … …	14′ 4″ ,,	—	—	—	—	—	Did not land on plot to-day; as seen with field-glass from shore, ridges still irregular and ill-defined.
,, 11 … …	15′ 5″ ,,	calm	—	—	—	—	No observations of the plot to-day.
,, 12 … …	16′ 1″ ,,	westerly (light)	estd. 6″ at max.	estd. 7′ 6″ to 8′ 6″	—	—	Plot all in sharp ridges from same quarter as at beginning of the month, but seven to eight wave-lengths in the 60 feet, instead of four.
,, 13 … …	16′ 9″ ,,	—	—	—	—	—	No observations.
,, 14 … …	17′ 7″ (p.m.)	—	—	—	—	—	Ditto.
,, 15 … …	17′ 9″ ,,	—	9″·71	11′ 9″	14·5	—	Five wave-lengths in the 60 feet.
,, 16 … …	17′ 9″ (a.m.)	south-westerly (light)	9″·7	11′ 2″·8 *	13·9	—	H.W. 10h. 15m. a.m. At 12h. 12m. p.m. in 3′ water current over plot 2′·93 per sec. (1·74 knot), mean of 9 determinations with a float. This was the strongest tide met with till sands dried.
,, 17 … …	18′ 3″ ,,	—	—	—	—	estd. 2′ 6″	The ridges are even better developed than yesterday.

* Wave-lengths only measured along one section. A ridge intruding a little way into the plot gives the low value. This is presumably just disappearing, when the average L will increase *per saltum* to 14′ 0″·5, with $\frac{L}{H} = 17·4$.

and a long subsiding swell afterwards. Again, the irregularity of the wave-lengths in a swell tends to diminish with time: so here, when the tides were falling off, the difference of successive wave-lengths of the tidal sand-ridges diminished thus:

TABLE IX.

June 1,	average	difference of	successive	L.'s	= 13·4 per cent. of the mean L.
„ 2,	„	„	„	„	= 11·4 „ „ „
„ 3,	„	„	„	„	= 10·7 „ „ „
„ 4,	„	„	„	„	= 4·4 „ „ „
„ 5,	„	„	„	„	= 6·6 „ „ „

The increase of uniformity goes on till we come to June 5, when, as has been noted in Table VIII., the diminishing tidal current seems suddenly to have lost control of the wave system. Table VIII. shows how the average daily advance varied from day to day; the subjoined table gives the details for each ridge:—

TABLE X.

DETAILS OF ADVANCE OF RIDGES OF EXPERIMENTAL PLOT (see Fig. 27).

	June 1–2.	June 2–3.	June 3–4.	Average daily advance for each ridge.
Ridge A	45″·87	34″·25	33″·62	37″·91
„ B	39″·25	32″·37	26″·25	32″·62
„ C	42″·00	31″·62	32″·25	35″·29
„ D	38″·75	28″·50	32″·25	33″·17
„ E	24″·50	22″·00	28″·50	25″·00
General average for each day	38″·07	29″·75	30″·57	—

From this it will be seen that the slight shortening of the average wave-length was due to the more rapid advance of the rear ridges, and the slower advance of the front ridges. The ridge E was at no great distance from the position where the ebb ceased to have the mastery over the flood; also the water was slightly shallower at E than at A. It seems natural that these circumstances should affect E more than A during the falling off of the tides. The orderly march of the sand-waves is rendered visible to the eye by the diagram (Fig. 27), which strikingly illustrates how the natural undulating surfaces of sand, by the regularity of their form and the precision of their movement, justify and reward investigation.

THEORY OF THE ORIGIN, GROWTH, AND DECAY OF SAND-WAVES IN CURRENTS, AND OF THEIR RELATION TO "CURRENT MARK."*

In the formation of a wave surface from a plane surface, there is differential movement of the parts of the body, accretion occurring at certain positions, and depletion at positions intermediate between them; or, if there be a general accretion or a general depletion going on, then there is an excess of the effect at certain positions and a deficiency of the effect at intermediate positions. It is easy to see in a general way that the sudden checking or quickening of a current of water will produce local alterations in the rate of drift of the sand over which it flows, which will cause inequalities of the otherwise smooth surface. Such I take to be the

* See also a paper, by the author, in the *Scottish Geographical Magazine*, vol. xvii. (January, 1901), on the "Formation of Wave-surfaces in Sand."

current mark of streams which remains a mere ripple on the surface of the sand, whether that surface be otherwise smooth, or whether, as in the circumstances dealt with in this paper, it be thrown into waves which grow to large dimensions. I have repeatedly observed, as I suppose others have also, that all rivers, except perhaps the most sluggish, have a visible pulsation or pulse. In the slower streams, or in those which are rapid, but in which sand only rests in the

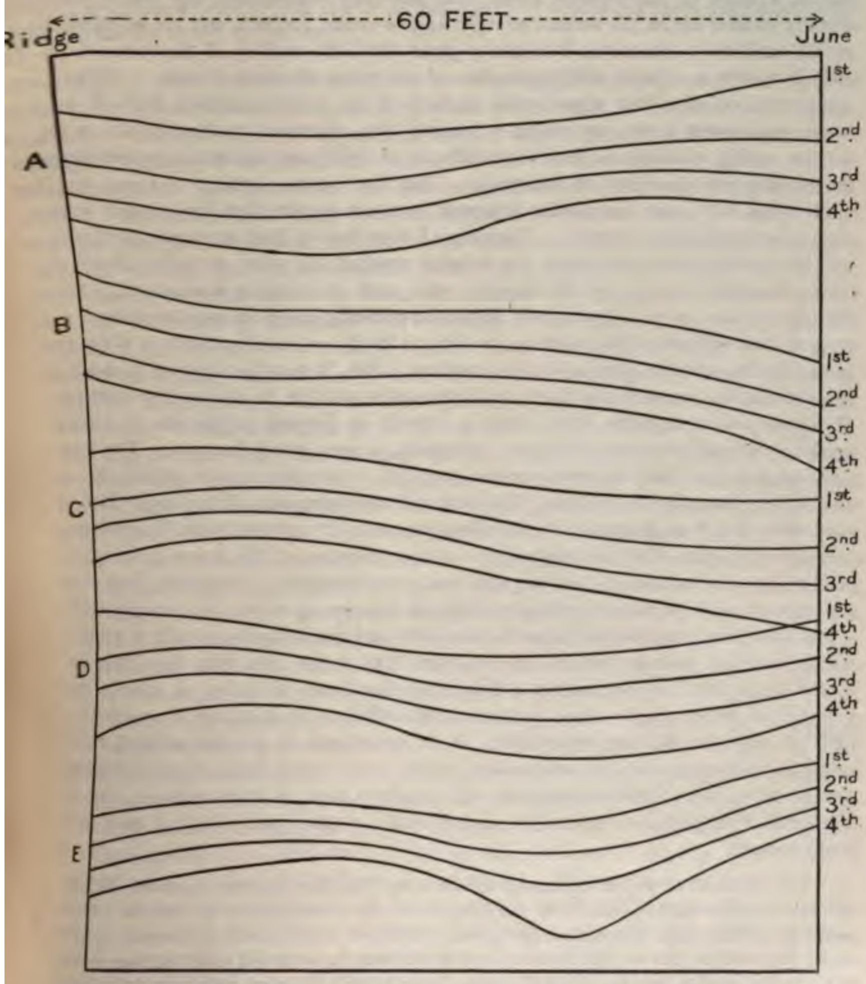


FIG. 27.—PLAN OF FIVE RIDGES SHOWING POSITIONS ON FOUR SUCCEEDING DAYS, DOVEY ESTUARY. SCALE, 1″ = 16′.

backwaters, the current mark is the characteristic sand-wave or ripple. In mid-current it faces down stream, but near the banks the wave-front usually extends diagonally across and down stream, facing somewhat towards the banks, and the drift of the sand may be seen in such cases to be no longer perpendicular to the face of the ridge, indicating that the ripple, as has been said, is not due to the steady action of the current.

The true current-formed sand-wave I find to be produced as soon as the velocity of the stream causes the water to be turbid with a heavy charge of sand in eddying suspension. The process can be watched in the shallow streams of sandy tidal foreshores. Their velocity varies much from point to point, and from minute to minute. Almost as soon as the velocity (the actual value of which, perhaps, depends partly on the depth) is attained at which the water becomes notably turbid, a train of sand-waves arises with startling suddenness, the wave-fronts quickly extend across the stream at right angles to the current, and the amplitude of the sand-wave sometimes becomes so great that the surface of the sand at its crest is nearly on a level with the surface of the water above its trough. The near neighbourhood of a free upper wave surface of the superincumbent fluid makes these sand-waves move up stream * (passing the observer on the bank with a motion readily visible), so that they differ in at least one important respect from the sand-waves described in this paper. But the commencement of the smaller sand-waves, as I have frequently observed, does not require that the water surface should be previously in waves. Therefore, I infer that in deep streams sand-waves will be similarly produced when the velocity reaches the point at which the lower strata of water become heavily charged with sand in eddying suspension. Now, the observations in this paper have shown how steady and how considerable is the growth in amplitude of the sand-waves formed by the action of currents in tideways from the time of their almost sudden creation. But, it may be objected, is not this the well-known current mark on the larger scale suitable to the swifter current? My observations negative this: there is indeed an increase in the size of current mark in the swifter stream, but it is, relatively, a very small increase. The large tidal sand-ridges may be seen covered over with this current mark, which is now a relatively insignificant feature. The fact that the formation of the larger kind of sand-wave is not accompanied by the disappearance of "current mark" is confirmatory of my opinion that the latter is due to the pulsation of the current, for as the current becomes swifter so does its pulse beat more strongly. I consider, then, that the current mark is due to pulsation both in streams of which the average speed is less than that required to throw the sand into eddying suspension, and in streams which have an average velocity greater than that value; but that the formation of the larger kind of sand-waves is due to another mode of action of streams, the velocity of which (apart from pulsation) is sufficient to maintain a considerable drift of sand in eddying suspension. It is incumbent to give an account of the principal movements of the sand-grains which must occur under these conditions, and to show that these movements will produce such a wave-surface. Let us start with Prof. Osborne Reynolds's description † of the steady drift of sand in a rapid current.

"The manner in which a current of water acts on the granular material forming the bed of the current has been the subject of an investigation by various experimenters. It has been found that the primary action is not so much to drag the grains along the bottom, but to pick them up and hold them in a kind of eddying suspension, at a greater or less height above the bed, for a certain distance and then drop them, so that when the water is drifting the sand there is a layer of water adjacent to the bottom of a greater or less thickness charged to a greater or less extent with sand. . . . A certain definite velocity, according to the size and weight of the grains, is required before the water will raise the grains from the bottom . . .; the effect of a uniform

* Cp. the author on "Kumatology," *Geographical Journal*, June, 1899.

† "On certain Laws relating to the Régime of Rivers and Estuaries, and on the Possibility of Experiments on a Small Scale." British Association, 57th Report (Meeting held at Manchester in 1887), p. 556.

current of water over a uniform bed of sand will not be to raise or lower the bed, for, as the charge of sand in the water remains uniform, it must drop as many particles as it raises everywhere on the bed. This is the action of the water in causing a uniform drift. It is also evident that if the charge in the water as it comes to any particular place is less than the full charge due to its velocity, it will pick up from that place more sand than it drops, and so increase its charge at the expense of the bed, which will there be scoured or lowered. And conversely, if the water as it arrives at any place is overcharged, it will relieve itself by depositing more than it picks up, and so raise or silt up the bed."

Under these conditions the drift is uniform *on the whole*, but it will be noticed that the equilibrium is of a peculiarly delicate character, for if across any section there be a slight excess of deposition, then in the next section, the water has not its full charge of sediment, the current "picks up more than it drops," and we have a scour. Let us consider the effect upon the drift of any small protuberance. Above the protuberance there is a convergence of currents from the weather side and lee side, and deposition therefore takes place upon the protuberance,* which is thereby raised. Just to leeward, the water, being deprived of a part of its charge, will scour, *i.e.* lower the bed. Thus we see that any slight inequalities of level will be immediately increased. The mounds so formed will extend themselves laterally at each end † even more quickly than they grow vertically, for there is the same forcing back of the bottom water "towards the centre of the curve" without the opposition and limitation which is imposed by gravity to vertical sinuosities. These actions, it is to be remembered, are described as occurring in a current of more than what we may term the critical velocity, in which the water is turbid with sand in eddying suspension, the conditions being other than those under which we are accustomed to observe (through the *clear* water) rippling action going on either in streams or in shallow wave-water of the sea or lakes, in which the sand is only thrown into such suspension momentarily by the jerk of the wave or of the pulse. The importance of the case we are dealing with lies in the fact that the inequalities not only become systematically arranged in transverse ridge and furrow, regular in form and movement, but that these inequalities grow beyond the ripple stage to what are better described as waves. It is not merely any small inequality which is increased, but any inequality even of considerable size. We must, therefore, specify the conditions which limit that growth. Moreover, in describing the various actions by which vertical inequalities are increased, one must be careful not to lose sight of the fact that such actions, although not exactly rare, are nevertheless the result of some exceptional combination of circumstances which overcomes the normal tendency of gravity to smooth out such inequalities. Therefore we must specify the conditions of decay as well as those of growth. One limit of growth must be the shallowness of the water. When the cross-section of the stream above the crest is reduced by a certain amount, the concentration of the stream there counterbalances the increase in the supply of sand, which is therefore removed from the crest as quickly as it is brought there, and the height of the ridge no longer increases. Any diminution of depth, *e.g.* by falling tide, would then reduce the amplitude of the ridge. In a deep current the height of the ridges is limited by the strength of the eddy which the velocity of the current

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* Compare G. H. Darwin's observation of the sand-grains creeping up a ridge from both sides simultaneously when a current was passing over it, *Proceedings Royal Society*, vol. xxxvi. p. 22.

† Compare James Thomson, "On the Winding of Rivers in Alluvial Plains," *Proceedings Royal Society*, 1876 and 1877.

enables it to maintain. If the ridge exceeded a certain height, there would be dead water on the lee side, and the trough would therefore silt up, diminishing the amplitude. It is probable, also, that the height of the ridges is sometimes restricted by the velocity of the water surpassing the limit suitable to the fineness or lightness of the material of which they are composed.* For the development of steep and large sand-waves, it is presumably necessary that the velocity should decrease somewhat rapidly as we go downwards through the lower layers of water, so that there may be much differential movement and a fairly definite surface of separation between the watery sand and the sandy water. Again, suppose large and steep ridges of sand to be exposed to a torrential current, or such ridges of light non-coherent mud to be exposed to a fairly strong current, then the difference of pressure upon the weather and lee faces respectively will cause a bodily sliding of the ridges into the troughs. When wading among the tidal sand-ridges, one constantly caused such slips. A moderate range in the sizes of sand-grains helps to preserve a definite surface of separation, the larger sorts being there concentrated.

Prof. Osborne Reynolds † found that in his model estuaries the ripples "formed by the alternating action of the tide" had a wave-length equal to twelve times their amplitude ($L = 12H$). The tidal sand-ridges observed by me at low water on the dry sandbanks were often in a condition of partial decay, owing in some cases to violence of the last runnings of the ebb, and in others to a falling off of the tide after springs. The greatest recorded steepness for the average of a train of (fifteen) wave-lengths was $L/H = 13·39$. How far alternation of tidal currents was in these cases responsible for the observed steepness is not quite clear, but I think that a slow return current does not necessarily act so as to increase the steepness of the ridges, although it may improve the regularity of the wave-fronts. It is to be observed in this connection that the salient angle for the direct current is the re-entrant of the return current, and that the return current will therefore check any tendency of the direct current to find a channel through the ridges. I have not at present made observations upon large sand-waves in deep non-tidal streams,‡ and am unable to state positively what are the steepest sand-waves there formed.

Before the reading of the paper, the PRESIDENT said: We are now well acquainted with our friend who is going to read the paper to-night. I am glad to be the first to announce publicly that he has received the degree of Doctor from the Victoria University—a gratifying endorsement of our conferring upon him one of our awards last year in recognition of his services to Geography. The paper he is going to read to us to-night is entitled "Travels in Search of Waves during 1900." I now call upon Dr. Vaughan Cornish to read his paper.

After the reading of the paper, the following discussion took place:—

Captain WILSON BARKER: I am afraid I cannot add much to the very interesting and beautifully illustrated paper Mr. Vaughan Cornish has given us this

* In the interval between the writing of this paper (Oct. 1900) and its publication, I have made observations upon the rate of subsidence of (snow) particles as related to the production of silt and scour respectively.

† 'First Report of Committee on the Action of Waves and Currents,' etc., pp. 16, B.A. 59th Report, Meeting of 1889.

‡ Since writing this sentence I have seen, but not measured, sand-waves similar to those described in this paper, in the Fraser river, British Columbia, above the locality to which the tide extends.

evening. My observations have been almost entirely confined to waves at sea. He has pointed out the existence of a very considerable difference of opinion on the height of waves, and of course it is an extremely difficult thing to have any correct idea of the altitude within a few feet. I am quite prepared to accept the statement that waves have been seen at sea up to 40 or 50 feet in height; but when I gave the approximate height, I of course meant the average height. As a rule, my experience is that waves in high southern latitudes are higher and more regular than those in any other parts of the world; that is a thing we might naturally expect. The motions that Mr. Vaughan Cornish speaks of, of the wind blowing up the waves, is also very interesting, showing the little ripple-marks on the waves, and when the wind is very strong we get what we call spoon-drift blowing off the top of the waves in addition. I do not think I can say anything more, except that I have been extremely interested in Mr. Vaughan Cornish's beautiful views.

The PRESIDENT: Have you any method of measuring the height of waves?

Captain WILSON BARKER: The general method is to mount the rigging and take observations from there; but I was in a sailing ship where we had a standard compass at a considerable elevation with a platform round it, which offered a most favourable opportunity for taking wave observations at different heights. When a ship is running before the wind she is more or less on an even keel, under which condition the chances of error in estimating wave-heights is reduced to a minimum, particularly when a number of observations are taken; though, of course, all estimates of heights can only be given as approximate.

Dr. MILL: There is little that I am able to say on this most interesting paper. It has been a great pleasure to hear the extremely clear manner in which Dr. Vaughan Cornish—as I am pleased to be able to call him—has shown us the remarkable similarity between the effects of this rhythmic wave-movement in air, water, and sand. It is, to my mind, one of the great advantages of geography as a science that it unifies a number of subjects which are at first sight apparently remote, and I rather think it would have surprised the founders of this Society if they had foreseen an occasion when the forms of clouds would be taken in as part of the science of geography. Dr. Cornish has shown us, not only by his clear explanations, but by his really magnificent photographs, how unmistakable this similarity is. The one point on which I am not quite clear, is whether all those ridges shown in the estuaries are really parts of waves, or whether they are merely heaps of sand accumulated on a surface which one might assume to be level. That, I have no doubt, has been duly considered in the full paper, which as yet I have not seen. It is an extreme pleasure to me to hear the description of these gravel ridges which are so familiar to me along the shore of the Moray Firth, and of the peculiar phenomena seen on the sands at Grange. It has struck me that a good deal of the peculiarity of the latter phenomenon must be due to the somewhat unusual composition of the sand, which contains a good deal of carbonate of lime worn from the lower carboniferous rocks of that region. The sand has a peculiar tenacity; you can feel the surface firm but movable when you put your hand down, something like the skin of a dog. Dr. Cornish has shown admirable tact in presenting his matter, and has presented it so briefly and so clearly as to be a pleasure to all hearers.

The PRESIDENT: It is now four years since Mr. Vaughan Cornish gave us the first of an interesting series of papers on the subject of the formation of waves and sands and sea-beaches. His first paper, I remember, was on the sand-dunes, and was mainly theoretical, derived from his observations on beaches in England. His second paper on that subject was more complete, for he had visited the sand-dunes of Egypt. To-day he has taken us over the sands and waves of the sea

and clouds and snow, and I think he has vindicated the practical character of his investigations as well as their scientific importance, especially with regard to the complicated currents in estuaries being traced by these sand-ridges. I am sure you will all join in a unanimous vote of thanks to Dr. Vaughan Cornish for his very interesting paper, and for the extremely beautiful illustrations of clouds and sand-ripples.

SOME RECENT CENSUS REPORTS.

The United Kingdom.—The preliminary report of the census taken on March 31 shows that the population of England and Wales is 32,526,075; of Scotland, 4,471,957; of Ireland, 4,456,546; and of the Channel Isles and the Isle of Man, 150,599; total, 41,605,177. The increase during the past decade has been 3,724,413, or 9·8 per cent., while for the period 1881–91 it was 8·2. The population of Ireland continues to decrease, while the growth in Scotland has been exceptionally large, so that the population of the latter now exceeds that of Ireland.

The increase in the population of England and Wales has been 3,523,550, or 12·15 per cent., and is half a per cent. greater than in the previous decade. There is an excess of females over males amounting to 1,082,619, which figures will be somewhat reduced when the returns of men serving in the army, navy, and merchant service come in. Excluding the counties immediately round London, the growth of which is to a large extent that of the metropolis itself, those which have made the greatest strides are Lancashire, with an addition to its population of 262,694; the West Riding of Yorkshire, with 166,438; Glamorgan, with 133,138; Durham, with 112,821; and Staffordshire, with 108,360. If the percentages be taken, Glamorgan heads the list, with 28·5 per cent., and is followed by Northumberland, 21·4; Worcestershire, 20·5; Derby, 18·6; and Nottingham, 18·5. In twelve counties there has been an appreciable decrease of population, among which Oxford has lost 6635 inhabitants, Devon 5077, and Norfolk 4863. The greatest proportional loss, however, has been in Montgomery, namely, 5·4 per cent.; and Oxford with 4·6, and Rutland with 4·6, are next in order.

The Isle of Man and the Channel Isles, with the exception of Guernsey and Alderney, have a smaller population than in 1891.

The following table shows the populations in 1891 and 1901, and the increase or decrease in percentages. The density is 557·8 to the square mile.

	Popn. in 1901.	Inc. or dec. per cent.
England and Wales	32,526,075	12·15
62 Administrative Counties	23,387,192	11·2
67 County Boroughs	9,138,883	13·3
Counties: England—		
Bedfordshire ...	171,700	6·4
Berkshire ...	180,366	2·4
Buckinghamshire	196,844	5·4
Cambridgeshire ...	120,634	0·0
Isle of Ely ...	64,494	1·8
Chester	601,070	12·2
Cornwall	322,960	0·1
Cumberland ...	266,924	0·1
Derbyshire ...	504,577	18·6
Devonshire ...	437,210	−1·1
Counties: England—*contd.*		
Dorsetshire ...	202,092	4·4
Durham	833,614	15·8
Essex	816,503	41·1
Gloucestershire ...	331,516	2·3
Herefordshire ...	114,150	−1·4
Hertfordshire ...	258,045	13·9
Huntingdonshire	54,127	−1·6
Kent	936,003	15·3
Lancaster... ...	1,827,390	16·8
Leicestershire ...	225,896	12·0
Lincolnshire—		
Holland ...	77,583	1·8
Kesteven ...	103,958	−1·3
Lindsey ...	206,497	3·7
London	4,536,063	7·3

	Popn. in 1901.	Inc. or dec. per cent.
Counties: England—*contd.*		
Middlesex ...	792,225	45·9
Monmouthshire ...	230,800	13·5
Norfolk	313,438	−1·5
Northamptonshire	207,467	9·6
Soke of Peterborough ...	41,119	16·7
Northumberland...	388,059	21·4
Nottinghamshire	274,684	18·5
Oxfordshire ...	137,118	−4·6
Rutlandshire ...	19,708	−4·6
Shropshire ...	239,297	1·0
Somersetshire ...	385,060	1·8
Southampton (Hampshire) ...	377,118	12·8
Isle of Wight...	82,388	4·7
Staffordshire ...	879,618	14·0
Suffolk—Eastern	189,152	3·1
„ —Western	117,535	−3·1
Surrey	519,521	24·0
Sussex—Eastern	261,691	14·9
„ —Western	151,541	7·5
Warwickshire ...	347,691	15·4
Westmoreland ...	64,411	−2·7

	Popn. in 1901.	Inc. or dec. per cent.
Counties: England—*contd.*		
Wiltshire	271,372	3·4
Worcestershire ...	358,356	20·5
Yorkshire—East Riding	145,194	2·8
Yorkshire—North Riding	285,671	0·6
Yorkshire—West Riding	1,460,861	12·9
Wales—		
Anglesey	50,590	1·0
Brecknock ...	54,211	5·5
Cardigan	61,076	−3·8
Carmarthen ...	135,326	3·6
Carnarvon ...	125,669	6·9
Denbigh	131,588	10·6
Flint	81,490	5·8
Glamorgan ...	601,092	28·5
Merioneth ...	48,774	−0·2
Montgomery ...	54,892	−5·4
Pembroke ...	87,910	−0·4
Radnor	23,263	6·8

In the following table are given the boroughs with more than 100,000 inhabitants, their population, and increase in percentages, changes in the municipal areas being accounted for :—

Borough.	Popn. 1901.	Increase per cent.
Birkenhead	110,926	11·1
Birmingham	522,182	9·2
Blackburn	127,527	6·2
Bolton	168,205	14·8
Bradford	279,809	5·3
Brighton	123,478	6·6
Bristol	328,842	10·2
Cardiff	164,420	27·5
Croydon	133,885	30·4
Derby	105,785	11·4
Gateshead	109,887	29·4
Halifax	104,933	7·4
Kingston-upon-Hull ...	240,618	20·0
Leeds	428,953	16·7
Leicester	211,574	21·2

Borough.	Popn. in 1901.	Increase per cent.
Liverpool	684,947	8·8
Manchester	543,969	7·6
Newcastle-upon-Tyne ...	214,803	15·3
Norwich	111,728	10·7
Nottingham	239,753	12·1
Oldham	137,238	4·4
Plymouth	107,509	20·9
Portsmouth	189,160	18·8
Preston	112,982	5·0
Salford	220,956	11·5
Sheffield	380,717	17·4
Southampton	104,911	27·7
Sunderland	146,565	11·3
West Ham	267,308	30·5

Besides these twenty-nine boroughs, there are thirty-eight others with populations ranging down to 24,868 (Canterbury), all of which have grown during the past decade except Bath, Chester, and Huddersfield. The City of London continues to lose its resident population, which has fallen from 37,705 to 26,897. Several other metropolitan boroughs situated in the central parts of the area have a smaller population, while those in the outskirts have gained a large addition, especially Fulham and Wandsworth.

The population of Scotland, now 4,472,000, has increased during the decade by 446,353, or 11·09 per cent. As is shown in the following table, the population has increased in nineteen counties and decreased in fourteen. The density has risen to 150·1 to the square mile.

County.	Popn. in 1901.	Inc. or dec. per cent.	County.	Popn. in 1901.	Inc. or dec. per cent.
Aberdeen	304,420	7·2	Kinross	6,980	4·6
Argyll	73,665	−0·6	Kirkcudbright ...	39,407	−1·4
Ayr	254,436	12·4	Lanark	1,139,289	21·1
Banff	61,487	−0·3	Linlithgow	65,699	24·4
Berwick	30,816	−4·6	Nairn	9,291	1·5
Bute	18,786	2·1	Orkney	28,698	−5·7
Caithness	33.859	−8·9	Peebles	15,066	2·1
Clackmannan ...	32,019	−3·4	Perth	123,262	0·9
Dumbarton	113,870	16·2	Renfrew	268,934	16·5
Dumfries	72,569	−2·3	Ross and Cromarty	76,421	−2·9
Edinburgh	488,647	12·5	Roxburgh	48,793	−8·8
Elgin	44,808	3·1	Selkirk	23,339	−15·8
Fife	218,843	15·0	Shetland	28,185	−1·8
Forfar	284,078	2·3	Stirling	142,338	20·6
Haddington ...	38,662	3·4	Sutherland	21,550	−1·6
Inverness	90,182	0·1	Wigtown	32,683	−9·4
Kincardine	40,918	15·3			

Twenty-two towns contain more than 20,000 inhabitants, and of these the following nine contain over 50,000 :—

Aberdeen	153,108	Greenock	67,645
Dundee	160,871	Leith	76,667
Edinburgh	316,479	Paisley	79,355
Glasgow	760,423	Partick	54,274
Govan	76,351		

There are no data available for comparison with the populations of 1891. The additions have been in Edinburgh (14·8 per cent.), Glasgow (15·5), and Aberdeen (22·9); but these are due in part to enlargement of the city areas. Some of the smaller towns show a much greater rate of increase, as, for instance, Motherwell (62·5), Partick (48·6), and Wishaw (36·8).

The population of Ireland has fallen to 4,456,546, but the decrease is less than during previous decades, with the exception of 1871–81, being 248,204, or 5·3 per cent. The decrease has been greatest in Connaught, 9·7 per cent., and least in Ulster, 2·4 per cent.

County.	Popn. in 1901.	Inc. or dec. per cent.	County.	Popn. in 1901.	Inc. or dec. per cent.
Dublin	447,266	+7·3	Carlow	37,723	10·1
Down	289,335	+7·3	Kilkenny	78,821	9·9
Antrim	461,240	+7·0	Kildare	63,469	9·6
Monaghan	74,505	13·6	Armagh	125,238	9·2
Cavan	97,368	13·0	Waterford	87,030	9·1
Roscommon	101,639	12·8	Galway	192,146	9·0
Tyrone	150,468	12·2	Louth	65,741	8·6
Fermanagh	65,243	12·0	King's	60,129	8·3
Leitrim	69,201	12·0	Limerick	146,018	8·1
Cork, W.R.	131,668	11·6	Kerry	165,331	7·7
Longford	46,581	11·5	Wexford	103,860	7·3
Meath	67,463	11·4	Mayo	202,627	7·3
Clare	112,129	11·2	Donegal	173,625	6·5
Sligo	84,022	11·0	Tipperary, N.R. ...	68,527	6·2
Tipperary, S.R. ...	91,227	10·7	Wicklow	60,679	5·9
Queen's	57,226	10·4	Cork, E.R.	273,145	5·7
Westmeath	61,527	10·3	Londonderry	144,329	5·1

Only the first three have gained in the number of their populations, and this is due, for the most part at least, to the growth of Dublin and Belfast. 3,310,028 persons returned themselves as Roman Catholics, a diminution of 237,279, or 6·7 per cent. Other religious bodies have also declined in numbers, except Methodists.

Thirteen towns with a population exceeding 10,000 have increased during the decade. Of these the following have more than 50,000 inhabitants:—

Town.	Population in 1901.	Increase per cent.
Belfast	348,965 ...	27·8
Dublin	289,108 ...	7·6
Cork	75,978 ...	0·8

In seven other towns there has been a decrease, ranging from 6·9 per cent. in Drogheda to 0·7 in Limerick.

India.—The census taken on the night of March 1, 1901, shows that the population of India has risen since 1891 from 287,317,048 to 294,266,701, or only 2·42 per cent., whereas in the preceding decade the increase was 11·2 per cent. This result is mainly due to the figures for the native states, in which there has been a decrease of 4·34 per cent. In British India, however, the rate of increase has been only 4·44 per cent., and if the tracts now for the first time included in the reports be neglected, the increase for the whole of India is reduced from 2·42 to 1·49 per cent. How far the decline is due to famine and the plague, or to emigration induced by high prices and density of population, cannot yet be ascertained.

Provinces.	1901.	Increase or decrease per cent.
Ajmer-Merwara ...	476,330	−12·17
Assam	6,122,201	+12·67
Bengal	74,713,020	+ 4·72
Berar	2,752,418	− 4·99
Bombay (Presidency)	18,584,496	− 1·53
Burma	9,221,161	+18·66
Central Provinces	9,845,318	− 8·71
Coorg	180,461	+ 4·28
Madras	38,208,609	+ 7·24
North-West Provinces	34,812,174	+ 1·63
Oudh	12,884,150	+ 2·40
Punjab	22,449,484	+ 7·58
Baluchistan ...	810,811	—
Andamans ...	24,499	+56·95
Total ...	231,085,132	+ 4·44

Native States.	1901.	Increase or decrease per cent.
Haidarabad ...	11,174,897	− 3·14
Baroda	1,950,927	−19·23
Mysore	5,538,482	+12·03
Kashmir	2,906,173	+14·24
Rajputana ...	9,841,032	−18·1
Central India ...	8,501,883	−17·5
Bombay States ...	6,891,691	−14·49
Madras States ...	4,190,322	+13·23
Central Provinces States	1,983,496	− 8·19
Bengal States ...	3,735,715	+13·33
North-West Provinces States ...	799,675	+ 0·91
Punjab States ...	4,438,816	+ 4·12
Burma States ...	1,228,460	—
Total Native States ...	63,181,569	− 4·34
Total all India	294,266,701	+ 2·42

The area, then, in which the population has decreased on the whole may be roughly defined as a triangle, with its base extending from Rajputana to the south of the Bombay Presidency, and with its apex at the western boundary of Sambalpur, to which Kathiawar Gujrat and Cutch must be added.

The following twenty-eight towns have a population of more than 100,000:—

Calcutta (with suburbs) ...	1,121,664
Bombay	770,843
Madras	509,397
Haidarabad (with suburbs) ...	446,291
Lucknow	263,951
Rangoon	232,326
Delhi	208,385
Benares	203,095
Cawnpur	197,000
Agra	188,300
Mandalay	182,498
Allahabad	175,748
Amritsar	162,548
Jaipur	159,550

Bangalore	159,030
Howrah	157,847
Patna	135,172
Nagpur	124,599
Srinagar	122,536
Lahore	120,058
Meerut	118,642
Surat	118,364
Bareilly	117,433
Karachi	115,407
Poona (with suburbs)	111,385
Madura	105,501
Trichinopoli	104,690
Baroda	103,782

Of these towns, seventeen have increased in population during the decade, the largest additions being 35·2 per cent. in Howrah, 28·83 in Rangoon, 24·3 in Calcutta, and 20·67 in Madura, while Lahore lost 32·11 per cent., Poona 30·91, and Patna 18·17. The reduction in the urban population is not confined to the districts which have fewer inhabitants; for besides Lahore (−32·11), Bangalore, for instance, has lost 11·83 per cent., while, on the other hand, the city of Haidarabad has gained 7·53 per cent. In addition to the above, there are thirty-one towns in India with populations between 100,000 and 50,000.

German Empire.—The census of the German Empire was taken on December 1, 1900, and exhibits a greater rate of increase than has taken place in any previous lustrum. The percentage for 1895–1900 is 7·78, and for 1890–95 is 5·77, and consequently the rate of increase for the ten years has been 14 per cent., or 1·85 per cent. greater than in England and Wales. The density, however, is under 270, or less than half that of England and Wales. The population has increased in all the states, but more especially in Hamburg, Bremen, and Lübeck.

States.	Population in 1900.	Increase per cent.	States.	Population in 1901.	Increase per cent.
Prussia	34,463,377	8·19	Anhalt	316,027	7·75
Bavaria	6,175,153	6·13	Schw.-Sondershausen	80,678	3·34
Saxony	4,199,758	10·88	Schw.-Rudolstadt ...	92,657	4·48
Würtemberg ...	2,165,765	4·07	Waldeck	57,913	0·25
Baden	1,866,584	8·18	Reuss-Greiz ...	68,287	1·21
Hesse	1,120,426	7·83	Reuss-Schleiz ...	138,993	5·19
Mecklenburg-Schwerin	607,835	1·74	Lippe-Detmold ...	139,238	3·25
Mecklenburg-Strelitz	102,628	1·07	Schaumb.-Lippe ...	43,132	4·63
Saxe-Weimar ...	362,018	6·72	Hamburg	768,349	12·72
Oldenburg	398,499	6·62	Bremen	224,697	14·41
Brunswick	464,251	6·92	Lübeck	96,775	16·14
Saxe-Meiningen ...	250,683	7·13	Alsace-Lorraine ...	1,717,451	4·66
Saxe-Altenburg ...	194,273	7·74			
Saxe-Coburg-Gotha	229,567	5·99	German Empire	56,345,014	7·78

The several provinces of Prussia have also gained population, except East Prussia, which has lost 0·61 per cent. of its inhabitants. Westphalia with 18·01 per cent., the Rhine province with 12·79, and Brandenburg (exclusive of Berlin) with 10·14 per cent., have made the greatest strides.

Thirty-three towns of the empire have populations exceeding 100,000. Of these, Berlin is by far the largest, having a population of 1,884,345; it has increased during the five years by 207,041, or 12·3 per cent. With its suburbs, Charlottenburg (189,300 inhabitants), Schöneberg (99,000), Rixdorf (90,000), and others, it contains between 2¼ and 2½ millions. Hamburg comes next, with a population of 704,969, and an increase of 12·7 per cent. Several other towns show a much greater growth. Nuremberg, with 260,743 inhabitants, has increased by 60·6 per cent., Manheim (140,384) by 54·1, and Stettin (209,988) by 49·2. Crefeld alone (106,887) has lost a small number, namely, 358. Of the port-towns Kiel has increased the most, by 24·9 per cent. The aggregate increase in the above towns has been 13,666,340, or 15 per cent., during the five years' period, and since 1875 they have increased by over 116 per cent.

Austria-Hungary.—The census of December 31, 1900, gives as the home population of Austria, *i.e.* the portion of the empire on this side the Leitha, 26,107,000 souls, an increase, during the last decade, of 9·3 per cent., as compared with 14 per cent. in the case of Germany. Of the separate provinces, Lower Austria, which includes the capital of the empire, stands first with an increase of 16 per cent.; Carinthia and Carniola, in which the proportion of small centres is highest, standing at the bottom of the list with 1·8 and 1·9 per cent.

The great differences in the race and economic conditions of different portions of the population naturally cause great variations in its development, the primary causes for which are to be sought in the influence of geographical factors. Thus a series of districts which show a decrease of population follows the line of the Central Alps, while an increase far above the mean rate is shown by the industrial districts around Vienna and Prague, in the mining districts of Northern Bohemia, Eastern Silesia, and Northern Moravia, as well as in certain parts of Galicia and Dalmatia. Striking instances are supplied by Floridsdorf, close to Vienna, and by Ostrau in Moravia, which show increases of 44 and 56 per cent. respectively. The density has risen since 1890 from 31 to 34 to the square mile, and in Lower Austria from 52 to 60, Silesia and Bohemia coming next with 51 and 47 respectively. The Alpine provinces of Tirol and Salzburg have 12 and 10 only. The excess of the country over the town population shows a continued decrease, the proportion of 58 : 42 in 1890 having fallen to one of 54 : 46. Especially marked is the increase of the towns of between 20,000 and 100,000 inhabitants. The following table shows both the population of the larger towns within the administrative areas and that of the larger agglomerations of population where these form in reality single units. As in the case of Vienna (cf. vol. xvii. p. 427), the increase in the peripheral districts of the towns far exceeds that in their centres. Thus, while there is a general movement in the agricultural districts *towards* the towns, within these there is a centrifugal tendency. In Prague, *e.g.*, while the heart of the city has actually lost population (in one division, to the extent of 22 per cent.), the outer divisions have increased in some cases by a half or even three-quarters. Including these, Prague now stands, in the matter of population, between Leipzig and Munich, or between Leeds and Birmingham. The results for Hungary give a *total* of 19,203,531. Thus, out of every ten inhabitants of the monarchy about six live in Austria and four in Hungary, the precise ratio being 58 to 42. The increase in the latter is even greater than in the former, being 9·96 per cent. With its larger area, Hungary

POPULATION OF AUSTRIAN TOWNS.

	Administrative area.	Increase per cent.	Wider aggregate.	Increase per cent.
Vienna	1,662,000	22	—	—
Prague	204,000	12	460,000	30
Triest	179,000	13	170,000	16
Lemberg	160,000	25	—	—
Graz	138,000	23	—	—
Brünn	109,000	15	—	—
Krakau	91,000	22	123,000	28
Czernowitz	70,000	28	—	—
Pilsen	68,000	36	—	—
Žižkow	60,000	46	See Prague	
Linz	59,000	23	72,000	30
Kgl. Weinberge	52,000	52	See Prague	
Reichenberg	34,000	11	54,000	20
Ostrau (Moravia)	30,000	56	79,000	65

comes considerably behind as regards density, with only 23 to the square mile. The attraction of the capital is here still greater than in Austria, Budapest showing an increase, since 1890, of 45 per cent., which gives it a population of 713,383.

In 1874, at the time of the union of Ofen with Pest, it scarcely reached 300,000. The division as regards religions is as follows: Roman Catholics almost 61 per cent., Protestants over 14 per cent., and Jews nearly 24 per cent. In Bosnia and Herzegovina, a new census will presumably not be taken till 1905, the last having taken place in 1895.

Italy.—The census of Italy was taken on the night of February 9. Since the last census, on December 31, 1881, the population has increased from 28,459,628 to 32,449,754, or by 14 per cent. in the nineteen years. The mean annual increase, 7·34 per 1000, is rather greater than in the decade 1861–71, and much larger than in 1871–81, when it was only 6·19. The provinces of Rome, Liguria, and Sicily have increased the most. In the Basilicata alone there has been a decrease, of 34,504 persons.

Departments.	Population in 1901.	Mean ann. inc. or dec. per 1000.	Departments.	Population in 1901.	Mean ann. inc. or dec. per 1000.
Piedmont	3,326,311	4·4	Abruzzi and Molise...	1,442,365	5·0
Liguria	1,080,944	11·1	Campania	3,142,378	4·4
Lombardy	4,278,188	8·5	Apulia	1,949,423	11·9
Venetia	3,130,429	5·9	Basilicata (Potenza)	490,000	−3·4
Emilia	2,451,752	6·4	Calabria	1,375,760	4·9
Tuscany	2,548,154	8·0	Sicily	3,529,266	10·7
Marches	1,064,749	7·0	Sardinia	789,314	8·2
Umbria	644,367	6·6			
Lazio (Latium) ...	1,206,354	17·5	Kingdom of Italy	32,449,754	7·3

No return has yet been made of the urban population.

Switzerland.—The census of Switzerland was taken on December 1, 1900. The resident population is 3,313,817, according to the preliminary returns, and since 1880 has increased from 2,831,787, or by fully 17 per cent. All the cantons have increased populations, with the exception of Glarus, which has lost about 1800 inhabitants, or 5·4 per cent.; and Uri, which, however, has been growing since 1888. The town of Basel, with the communes attached to it, has increased by 52·2 per cent., Zürich by 27·6, and Geneva by 24·8. Other cantons containing no very large towns have also increased considerably; as, for instance, Soleure 18 per cent., Neuchâtel 16 per cent., the Valais and Vaud 12·5, and Uri 14. There are two towns with more than 100,000 each, namely, Zürich, 150,228, and Basel, 107,287; Bern has 63,994, and Geneva 58,867. All these have grown very much since the last census in 1888—in the case of Zürich, 59½ per cent. Six other towns, namely, Lausanne, St. Gallen, Chaux de Fonds, Lucerne, Winterthur, and Neuchâtel, have more than 20,000 inhabitants each. Probably the suburbs Plainpalais, Eaux Vives, and Sacconex will shortly be incorporated with Geneva, and then Switzerland will have a third town of more than 100,000 inhabitants.

Smaller Nationalities.—The population of Norway, as given in the preliminary report of the census of December 3, 1900, is 2,231,395, of whom 1,606,864 are inhabitants of the rural districts, and 624,531 of the towns. During the previous ten years the population increased by 230,478, or 11·5 per cent. There has been an increase in all the districts except Nedenes, but the towns have, as in other countries, increased in a greater ratio than the country districts. Christiania contains 225,686 inhabitants, and since 1891 has received an addition of over 48 per cent. Bergen has increased by over 34 per cent., up to 72,179. No other town has more than 50,000 inhabitants.

A census of the Netherlands was taken on December 31, 1899, when the total population was 5,103,924. The largest additions to the population since 1899 took place in North and South Holland (20·51 and 16·71 per cent. respectively), the

former containing the towns of Amsterdam, Haarlem, Zaandam, and Helder; the latter Rotterdam, Dordrecht, the Hague, Leiden, etc. Friesland has increased by only 1·4 per cent.

The population of Denmark, enumerated on February 1, 1900, is 2,447,441, and is 12·66 per cent. larger than in 1890. The rural population is 1,511,324, and has increased by only 5·17 per cent.; while the seventy-six towns contain 936,117 inhabitants, or 27·29 per cent. more than in 1890. Copenhagen (378,280 inhabitants) has gained 17·69 per cent.; Frederiksberg (76,237), 62·37 per cent.; and Aarhus (51,909), 55·85 per cent. There are ten other towns with more than 10,000 inhabitants each, all of which have made considerable strides. Esbjerg has gained 225·1 per cent., and has now 13,365 inhabitants.

Servia had on December 31, 1900, a population of 2,535,066, having increased by 7·2 per cent. in five years. Belgrade has 70,516 inhabitants.

The population of Crete, enumerated in June, 1900, was 307,369, including 6096 foreigners. The noteworthy feature is the decrease of the Mohammedans, who now number only 33,281. Candia has 22,331, and Canea (the capital) 20,973 inhabitants.

The Mexican census of October 28, 1900, shows that the population of the republic is 13,570,545, or 7·6 per cent. larger than in 1895. The most densely peopled districts are the Federal District, and those to the south of the city of Mexico, while the north, west, and east are more sparsely populated. The capital has 530,723 inhabitants.

Owing to the late war, and the misery which accompanied it, the population of Cuba has diminished by 58,890, or 3·6 per cent. of the number at the census of 1887. It is believed that until the outbreak of hostilities the Cubans multiplied at the usual rate, and in the ordinary course of events the number would in October, 1899, have amounted to 1,800,000, whereas the actual figures were 1,572,979. Havana has 235,981 inhabitants, Santiago 43,090, Matanzas 36,374, and Cienfuegos 30,038.

Porto Rico has added 16 per cent. to its inhabitants during the twelve years, and has now 953,243. The density is 264 to the square mile, while in Cuba it is only 35·7. The proportion of white men, 61·8 per cent., is less than in Cuba (66·9), but greater than in the other Antilles. The urban population is small, only 8·7 per cent. of the people living in towns of over 8000 inhabitants.

THE MONTHLY RECORD.

EUROPE.

Geological History of the Rivers of East Yorkshire.—This subject is dealt with by Mr. F. R. Cowper Reed, assistant to the Woodwardian Professor of Geology at Cambridge, in the Sedgwick Prize Essay for 1900. The essay is divided into chapters, treating in turn of the general characters of East Yorkshire, its geological structure, physical history, etc., the main subject of the study, viz. the history of the relations of the rivers to the geological structure, being reserved for Chapter V. Following in the main the lines suggested by Prof. W. M. Davis in the article which appeared in vol. v. of the *Geographical Journal*, the author regards the present drainage system as the successor of one which developed on a more or less continuous covering of cretaceous strata, ultimately wearing this down so as to produce a peneplain of diverse composition. The original surface sloped to the east or south-east, thus determining the original direction of the primary

consequent streams, the upper courses of which are represented at the present day by the upper portions of the Tees, Swale, Ure, Nidd, Wharfe, and Aire. In some cases their middle and lower courses can also be traced, but except in the case of the Aire-Humber are now rarely continuous, being broken up by capture and diversion into several disjointed portions. Thus the original course of the Tees is placed by the author along the line of the Leven and Esk, and of the Ure, along that of the Elphin beck, Hole beck, and Rye. The first cycle of development was marked by important changes, due to the formation of subsequent streams, the most successful of which captured the headwaters of many of the original consequents. Thus the Ouse, following the Triassic outcrop, appears to have captured the Wharfe and Nidd, and finally the Ure, which had previously captured the Swale. The second cycle was initiated by the strong Miocene uplift, giving rise to the new east to west watershed along the line of Glaisdale moor. The adjustments of streams previously brought about were for the most part revived, much of the new drainage being along the revived subsequent streams. The Ouse would therefore at once advance into primary importance. During this second cycle all the main topographic features of the region were developed, and many minor adjustments of river-courses, traced in detail by the writer, took place. The changes in the drainage of the Vale of Pickering may be specially referred to. In the first stage, the Rye (= the beheaded Ure) continued to flow through a gap in the Cretaceous escarpment in the direction of Bridlington. Meanwhile the subsequent stream flowing towards Filey along the Kimmeridge clay syncline, was rapidly growing headwards, until in course of time it tapped the original consequent Ure, the lower portion of which became a "dry chalk valley." At the close of the second cycle two only of the important features in the present drainage were undeveloped, the first being the reversal of the drainage of the Vale of Pickering above described, and its discharge through the Malton gorge. This was due to the damming back of the waters of the vale by the broad band of drift deposited along the coast-line, and the formation of a lake, which in turn was drained south-west by a *col* over the Howardian hills. In a similar manner the present headwaters of the Derwent, which once flowed east by the New Cut to Scalby, were diverted southwards by the Forge valley to the Vale of Pickering. The concluding cycles, though marked by oscillations in the level of the land, brought little change in the system of drainage.

The Bend of the Rhine.—Herr F. von Huene contributes an interesting study of the orography of the main bend of the Rhine to the *Geographische Zeitschrift.* The contrast to north and south of a point of vantage in the neighbourhood of Basle is graphically described, and the characteristic features of the drainage-systems of the north-western Jura and the south-western Schwarzwald are pointed out. The influence of geological structure is then traced, directly in the river-system of the Schwarzwald and the Jura ranges, and indirectly in the subsequent drainage of the plateau between the Jura range and the Rhine valley.

Geological History of Wallachia.—In a note in the *Comptes Rendus* of the Paris Academy of Sciences (vol. 132, p. 1140), M. de Martonne calls attention to certain points in the geology of the lands bordering the Carpathians to the south, which, he thinks, throw light on the history of the formation of the valleys of Wallachia and even the Danube itself. The writer had previously pointed out that the "Sub-Carpathian depressions" which lie along the foot of the range in Wallachia, were probably tectonic in origin, and had exercised an important influence on the formation of the transverse valleys of the range. His recent researches are held to have confirmed this theory. The subsidence to which the depressions in question were due seems to have been localized, in Western

Wallachia, on the immediate edge of the crystalline range of the Higher Carpathians, whereas in Eastern Wallachia it has affected the whole fringe of the range. In the region of subsidence, where eroding agencies have been paralyzed, many of the valleys have hardly been excavated at all in the diluvial platform, while shallow lakes abound. Many of the Danubian lakes may be ascribed to the effect of this depression, occupying as they do the lower end of valleys blocked by the alluvium which the great river is no longer able to carry away. Western Wallachia, on the other hand, is a region of elevation or relative stability, and the rivers, including the Danube itself, still exercise to the full their office of eroding agents.

The Greek Islands of the Ægean Sea.—To complete his work in Greece, and to enable him to compile a geographical description of the whole territory, Prof. Philippson was obliged to pay a visit in 1896 to the Cyclades and the Magnesian islands. Certain of the islands have been geologically investigated, but of many only a few short notices have been published, and therefore, though Prof. Philippson's journey lasted only two months, he was able to collect a large quantity of new matter, which he has published as an *Ergänzungsheft* to *Petermanns Mitteilungen*. He visited twenty-one islands, which he treats of separately, and then passes on to a general description of the whole groups. The Cyclades, except those in the extreme south-east, are a crystalline mass, connected with the mountains of Attica and Eubœa, in which it is impossible to detect a common line of strike. In the south-east folded sedimentary strata form the islands of Amargos, Anaphi, and Santorin. In Central Greece a folded mountain region of Mesozoic age (chiefly Cretaceous) lies between the crystalline mountains of Attica on the south, and those of Thessaly on the north. At their contact these groups are folded together or abut on one another along faults. This Mesozoic system is prolonged through Central Eubœa into the Magnesian group, where the border zones converge, the crystalline core cropping up through the partly metamorphosed Mesozoic deposits. All the land available for cultivation is utilized, and gardening and viticulture furnish the chief exports. Natural harbours are numerous, but, strange to say, the islanders are not a seafaring folk, a circumstance due, Prof. Philippson suggests, to the Venetian rule. Orographical and Geological maps are appended to the publication.

Lake Ladoga.—Colonel J. de Shokalsky informs us that he has this year continued his limnological investigations on Lake Ladoga (cf. *Journal*, vol. xvi. p. 471), and that they confirm his previous opinion that the lake approaches very near the true polar type. He hopes to visit the lake again in August, and promises us a summary of the general results of his work on its completion.

The Northern Urals.—A new geological map of the Timanski mountains, on the scale of $6\frac{2}{3}$ miles to the inch, has been published by Th. N. Chernycheff, as a result of his and Prof. Backlund's expedition of 1898–99. The map, which is in three sheets, is based on the new surveys of the expedition, and shows, as is remarked by the Academy of Sciences in its report, how erroneous were all the maps of the region which we hitherto possessed.

ASIA.

Rift-valleys of the Sinai Peninsula.—In a paper printed in the *Geological Magazine* for May of the present year, Dr. W. F. Hume notes some of the results, as regards the structural geology of the Sinai peninsula, of a survey executed in 1898–99, and embodied in a map by his colleague, Mr. H. G. Skill. Attention is first called to the important transverse divide which extends across the southern part of the peninsula from the central range to the Gulf of Akaba. The country on opposite sides of this divide is not only of different types, but in many parts of markedly different levels. It is crossed by five passes, connecting valleys

forming five roughly straight lines, all parallel to each other, and to the Gulf of Akaba. Two of these valleys, the Shelala um Raiyig and the Raib Melbadge, are shown to belong to the category of rift-valleys, bounded generally by steep slopes and often differing completely in geological structure on the two sides. The other valleys are considered to be rift-valleys * on account of their parallelism with the two above-mentioned, while other valleys in Western Sinai present similar features. Those to the west of long. 34° E. show a parallelism with the Gulf of Suez, while a third or transverse system may also be traced. The principal structural features of Southern Sinai are thus apparently due to fracture in three directions. The district is, in fact, the meeting-point of two great longitudinal rift-systems, parallel to the Gulf of Suez and Gulf of Akaba respectively, traversed by a third or transverse type, the result being the apparently intricate maze of sharp crest and deep valley characteristic of this region.

Dr. Sven Hedin.—Dr. Friederichsen communicates to *Globus* (July 11, 1901) the substance of a letter from Dr. Sven Hedin, received at Stockholm early in June, which gives some information as to the traveller's movements during the past winter and his plans for the present summer. Dr. Hedin, who wrote on April 14 from Charklik, near Lob Nor, was in the best of health, and had lately returned from a successful expedition to the Gobi, which had lasted four months. He reports still further discoveries of cities and temples along the shores of the old Lob Nor, as well as of a number of Chinese manuscripts. For the journey across Tibet to India which he was about to undertake, Dr. Hedin had got together a caravan of twenty-seven camels and thirty-six horses and mules with the necessary supplies. He was also sending a separate caravan to Kashgar, and despatching thereby his extensive collections, including his maps, photographs, etc. Further information was also to be forwarded by means of this caravan.

Russian Expeditions in Central Asia.—It is announced from St. Petersburg that an expedition is to be despatched to the Pamirs by the Imperial Russian Geographical Society, under the leadership of the well-known traveller and scientist Dr. Fedshenko. The object of the expedition will be researches in the field of geology, botany, and zoology. We also learn that an expedition has this summer been sent by the same society to explore Lake Telezkoie, in the Altai. The preliminary results show that the northern part of the lake is not deeper than 30 fathoms, but that in the south depths of 150 fathoms, and probably more, exist. The temperature on the surface was found to vary from $37\frac{1}{2}°$ to 39° Fahr., while at 125 fathoms it fell to 25·3° Fahr.

A Siberian Mammoth.—An expedition has proceeded this summer to Siberia to bring to St. Petersburg the skeleton of a mammoth lately discovered in an unusually good state of preservation. Not only are the hair, skin, and flesh still intact, but remains of undigested food have been found in the stomach. The find was made in the neighbourhood of Kolymsk, in north-east Siberia, and the expedition arrived at Yakutsk, *en route* for that remote settlement, on June 14 last.

Recent Geology of Northern and Central Asia.—In the May number of the *Quarterly Journal of the Geological Society* there is a short paper by Prof. G. F. Wright on recent geological changes in Northern and Central Asia, as deduced from the results of researches carried out by him in 1900. Being familiar with the glacial phenomena of North America, and in a less degree of Europe, Prof. Wright planned his journey with a view to searching for similar evidence

* The author speaks of the valleys, not as due to rifts, but as themselves rifts, which seems to imply a much smaller width in proportion to the height of the sides than is found in the African rift-valleys.

of past glaciation in the parts of Asia which might be supposed to present the greatest analogies with the other northern continents in this respect. In this, the main object of his journey, he was unsuccessful, no traces of extensive past glaciation being met with in Japan, Mongolia, Manchuria, Eastern Siberia, or Russian Turkestan, all of which were in turn visited. In Mongolia the route led over the great loess region, and while allowing the important part played by the wind in the deposition of the loess, Prof. Wright holds that there are features in its distribution which seem unmistakably due to water action. In the region of the Sungari, which was next visited, the point which attracted most attention was the sluggish drainage which characterizes all the streams, the troughs of which are very old, and show a recent depression resulting in an extensive filling up of the channels. The recent origin of Lake Baikal is inferred from the fact that it has not been filled by the sediment due to the extensive erosion carried out by the Selenga and other rivers. In Turkestan the loess deposits, lying on exactly the opposite side of the central plateau to those of China, again attracted attention, and in Prof. Wright's opinion can only be explained by supposing a widespread submergence of the region to the extent of 3000 feet. Other facts which are supposed to point in the same direction are also adduced, among them being the small degree of salinity of Lake Balkash and other waters of the region, which is held to indicate very recent physical changes. The absence of continental glaciers in Asia is attributed partly to the permanent climatic conditions which render so much of Asia a comparatively dry region, and partly to a lower elevation as compared with America.

Marine Fauna of Peter the Great Bay.—In a preliminary report of his work in the Sea of Japan (*Izvestiya of the Imp. Russ. Geogr. Soc.*, vol. xxxvi., No. 5) M. Schmidt states that the fauna of Peter the Great bay is composed of two elements—namely, of forms found in the Sea of Japan as far south as Nagasaki and Fusan, and occasionally occurring even further south, and, secondly, of northern forms which, apparently, here reach their extreme southern limit, and have their centre of distribution in the Sea of Okhotsk. To the former class belong species of *Sebastes*, *Belone*, *Tetrodon*, *Gadus*, and varieties of mackerel; to the second, numerous representatives of the Cottidæ family, the genus Centridermichthus being particularly rich in species, and of the Bleniidæ, flat-fish, herring, smelts, and species of Agonus and Siphagonus. Among crustaceans, the southern forms *Portunus japonicus*, *Gebia major*, *Dorippe sp.* and *Pisa sp.* live side by side with the huge *Lithodes kamchatica*, which is not found further south, but occurs in the Sea of Okhotsk. Apparently the southern fauna predominates, but this will be determined when the whole collection of specimens has been examined. The fauna of Broughton bay on the coast of Korea, in which M. Schmidt also travelled, is very similar. Southern forms are only very slightly more numerous, while the northern species do not, in most cases, roam so far. M. Schmidt proposes to make himself acquainted with the fauna in more southern bays of the Korean coast, in the main Kuro-Shivo current, and between Vladivostok and the mouth of the Amur, so as to be able to institute a comparison, which will, he believes, throw some light on the existence of a cold current from the Sea of Okhotsk.

The East Coast of Korea.—Leaving for a time his biological work in the Sea of Japan, M. Schmidt made in 1900 (*Izvestiya*, vol. xxxvi. No. 5) a journey along the road from Wönsan to Fusan, a route probably followed only by M. Karneyef, who has not published an account of his journey. The road connects a series of small towns, of which the first, Ambun, was reached the day after the departure from Wönsan. It stands at a distance from the sea at the foot of a ridge of no great

height, which runs out from the main chain perpendicularly to the coast. Following this ridge M. Schmidt reached the shore, and for three days travelled through the same kind of country—plains covered with rice-fields, which are irrigated by streams descending from the mountains, and are sometimes interrupted by low spurs. There are several lagoons communicating with the sea by channels, some of which, as for instance the Suchumde, are of considerable size; others, and these the more numerous, are cut off from the sea by sandbanks, apparently of recent formation. From the Chogu-chen-dogu bay M. Schmidt made an excursion into the Almazinya (Diamond) mountains, crossing the watershed from the valley of the Uonjong to that of the Han, and returning by the Ammude-koge pass to the town Kosöng on the coast. A few days later a companion, Dr. Lange, left him at Kansöng to make his way to Söul by the little-known route past the town Inje. The country to the south being uninteresting, consisting as before of rice-fields and lagoons, M. Schmidt turned inland from Kannin and crossed the main drain by the high and difficult Tegulieng pass, descending to the river Kwanmul in the Han basin, and thence reaching the road from Soül to Fusan. The map of the Japanese General Staff, at any rate as translated by Colonel Laterner, shows here many errors. From Chaugnima the traveller journeyed to the Chun-yon-che pass placed in the Japanese map beside the mountain Chun-yan-san (in the Russian copy, entitled Popof). The natives, however, give this name to all the neighbouring mountains collectively, and the highest peak in the neighbourhood they call Sansanbong or Tasilno. This M. Schmidt ascended to a height of 4600 feet, as shown by an aneroid, and estimated that the summit rose only 300 to 350 feet above him. He then crossed the Chun-yon-che pass and proceeded to Fusan.

AFRICA.

Baron Erlanger and Herr Neumann in Southern Abyssinia.—The information supplied by Herr Neumann to the *Verhandlungen* of the Berlin Geographical Society (*Journal*, vol. xvii. p. 528) is supplemented by a letter from Baron Erlanger, published in the same periodical (1901, p. 240), and accompanied by a sketch-map, which, though making no claim to exactitude, throws light on the complicated lake-system of Southern Abyssinia. It seems that the two travellers journeyed separately, though by the same route, from Adis Abeba to Lake Abbaya, beyond which they took nearly opposite directions. After passing the south-west end of Lake Zuai, the islands of which were visited *en route*, Baron Erlanger passed southward between Lakes Afjadda (Hora of Wellby) and Langano, a newly discovered lake lying east of the former, and discharging to it (as does Zuai by the Suksuk) by a stream named Daka. Langano has a very irregular outline, and it could not therefore be mapped with precision. North of it lies Mount Aluto, on the north-east side of which another lake was reported by the natives. Leaving on the west the shallow lake Shahalla, which seems to be the Lamina of Wellby, the expedition reached Lake Abassi, which, like Shahalla, was reported by M. Darragon in 1897, though but vaguely shown on his map. In the dry season it forms two basins connected by a channel, but in the rains it overflows and forms a single large lake. The march round its north-east end led through primeval forests traversed by swampy streams and occasionally broken by mountain spurs running down to the lake. Count Erlanger failed to obtain permission from the Abyssinian chief to proceed direct to Lake Abbaya (Pagade of Bòttego), but was obliged to ascend the high plateau to the south, on which forests of junipers were seen. At Aberash, or Abera, the expedition was well received by the chief Balkha, who had under him an army of over two thousand Abyssinians. Proceeding to Lake Abbaya, the count followed its eastern shore

and traversed the mountainous neck of land which separates it from Gangyule (Abbaya of Donaldson Smith). He says that both the inflowing stream from the northern Abbaya and the outlet to the Sagan have underground courses, a fact which explains the uncertainty which has prevailed as to whether the Sagan were really an emissary of the lake. A circuit was made round the west of Gangyule, after which the Sagan valley was visited, and a return to the north-east effected by a route over the highlands intermediate between Bòttego's and Darragon's. From Abera the route was continued to the north-east, the loss of the baggage-animals by sickness being made good by porters supplied by the Abyssinian authorities. On the headwaters of the Jub the itinerary of Bòttego's first expedition was struck, and at Ginea, in the upper basin of the Webi, that of Dr. Donaldson Smith in 1894. The Baron hoped to return to the south and reach Lake Rudolf by a new route. News from Herr Neumann is also given at p. 325 of the *Verhandlungen*. After separating from Baron Erlanger, he had, with difficulty, made his way across the Omo to Kaffa and Jimma. Thence he started to survey the middle of the three principal branches of the Sobat, which, according to the latest news, he had already accomplished, having reached Fashoda before June 15 after a successful journey.

Explorations in the Kamerun.—The issues of the *Deutsches Kolonialblatt* for April 1 and 15 last contain accounts of journeys by Captain Ramsay and Herr von Puttkamer in the north-western interior of the Kamerun, which have opened up some previously unvisited districts. Captain Ramsay's route led north from the town of Kamerun (to be known henceforth, as is announced elsewhere in the *Kolonialblatt*, as "Duala," in order to distinguish it from the Kamerun territory) by the Mungo river and the Bali road to Manyeme, in about 5° 20′ N., whence it lay north-west as far as Nsakpe, near the rapids of the Cross river. During this part of the journey the course of the Aja, an important but hitherto unmapped tributary of the Cross river, was traced. In the neighbourhood of the British frontier Captain Ramsay executed a careful survey, and found that in the rainy season the so-called Ethiope rapids were not to be seen.* A British gunboat has, in fact, passed some distance above them to near Nsanakang, important as a trade centre and from the abundance of brine springs in its neighbourhood. The Aja, at a point one or two days' journey above its junction with the Mangu or Cross, was 70 to 80 yards wide, with steep banks clothed in dense forest. The further route led north-east, across the Mangu, through a difficult region of forests and mountains previously unvisited by white men. The water-parting between the Cross and the Biya, a tributary of the Benue, was crossed, and the expedition pushed to a point some 50 to 60 miles north of Bali before turning southward to that town, the importance of which as a trade centre has, Captain Ramsay thinks, been over-estimated. Herr von Puttkamer's outward route led north from the Rio del Rey to the Cross river, but the return was effected by Captain Ramsay's route, which can be followed on the sketch-map accompanying the second report.

POLAR REGIONS.

Bear Island.—When Prof. Nathorst landed on Bear island in 1898, he proposed to Mr. Gunnar Andersson, who accompanied him, that he should return the following year to make a more thorough examination. This suggestion was carried out, and in June, 1899, Mr. Andersson, accompanied by Messrs. Forsberg &

* Captain Becroft, in his attempt to ascend the river in the *Ethiope* (1842), was stopped, not by obstructions in the channel, but by the extreme violence of the current, due to the narrowing of the river.

Swenander, landed on the shore of a bay at the mouth of the Russian river, which they named Russian harbour. The scientific results of the visit are described in *Ymer*, No. 4, 1900. According to Mr. Andersson, the Burgomaster Gate could not be found in 1898. In the following year it was found that the arch had fallen in since Nordenskiöld's visit in 1864, but the rock was identified by the iron pin inserted for tide-measurements. Mr. Andersson agrees with Sir Martin Conway, that Poole's Mount Maleperdus (named during his voyage in 1605: see Purchas' *Pilgrimes*) is identical with the Mount Misery of modern maps, but asserts that Poole's Mount Misery is not Mount Hamberg, but is some point on the south-eastern coast. The cartographical work of the party was confined to a survey of Russian harbour and a general verification of Prof. Nathorst's map, which proved to be very accurate. A closer examination of the topography revealed a number of trough-like faults in the southern mountainous part of the island, running north and south. One starts from South harbour, another lies between Russian river and Mount Misery, and a third forms a valley called by Mr. Andersson Ymersdal, between the Hamberg and Antarctic mountains. In these cases the less compact Carboniferous, Devonian, and more recent Heklahok slates have sunk down between the harder rocks of the older Heklahok series. Two-thirds of the island are occupied by a low plain with innumerable small pools, terminated along the coast by a recently abraded edge 80 to 100 feet high, and rising to more than 300 feet north of Oswald's point and the western peak of Mount Misery. All indications seem to show that it is due to abrasion, which still continues to act along the coasts. The direction of the glacial striæ points to a movement of the ice from west to east, and erratic blocks confirm their evidence. No rocks of a kind not present *in situ* on the island have been found. De Geer has lately suggested that the glaciation of East Spitsbergen may have extended to Bear island, but that all traces of it have been erased by subsequent local glaciation. Prof. Nathorst found no trace of a post-glacial elevation of the land, and no strand ridges or terraces mark a higher water-level, so that apparently between two regions of elevation, northern Norway and Spitsbergen, there is a tract where no elevation has taken place in any post-glacial period. But here again it must be remembered that abrasion may have removed all signs of such movements. In the interior mud streams have done much to change the surface. In early summer, when the valley bottoms are free of snow, the drifts still remain on the slopes in a melting condition, and the water from them permeates through the detritus immediately below them until at length these sodden masses begin to move downwards into the valleys. Like glaciers, they shoot out narrow tongues, and also have terminal moraines. One such stream north of the Ella lake had a breadth of 115 feet, and a depth of fully 68 feet. Its terminal moraine, consisting of sandstone flags tilted up on end, was 56 feet broad. To these Swenander attributes in great measure the sterility of the island; the phanerogams, which, with the exception of *Kœnigia islandica*, are perennials, being easily swept away by the mud streams. A new find for Bear island was *Fusulina* limestone, an interesting type of the Carboniferous system. In a position between Scandinavia and Spitsbergen a mingling of arctic forms of life with those of lower latitudes might be expected. But, apart from birds, the fauna, as well as the flora, is exceedingly scanty. The only permanent mammals are foxes, besides which polar bears come over the drift-ice in winter. Among the birds some have a southern distribution, as the razorbill, which breeds on the Scandinavian coasts, and the common guillemot. Of the arctic puffin there are two varieties, of which the southern is very common on Bear island, while only one specimen of the northern (var. *glacialis*) was observed. A variety of charr peculiar to the island, caught in

the Ella lake, has been named by Dr. Lönnberg *Salmo umbla*, var. *salvelino-insularis*. The fish is particularly interesting, because it resembles the more southern *Salmo umbla salvelinus* rather than the *Salmo umbla stagnalis* of Spitsbergen and Greenland. The poverty of the flora is shown by the fact that, while 125 species have been found on Spitsbergen, only 45 occur on Bear island. These, however, include the southern forms *Rhodiola rosea* and *Salix herbacea*, which do not grow in Spitsbergen. The meteorological observations supplement those taken by the whaling skipper Sievert Tobiesen, who wintered on Bear island in 1865–66. The mean for the year is 23·2° Fahr.; for the months October to April, 15·3°; May to September, 34·2°; and June to August, 37·6°. The yearly mean is 2·3° higher than that at Cape Thordsen, Spitsbergen, and other values differ in the same direction.

The Baldwin Arctic Expedition.—A telegram from Tromsö, dated July 17, announced the departure for the north, on the previous day, of the polar expedition under Prof. Baldwin, which has been equipped through the munificence of Mr. W. Ziegler, of New York. The expedition consists of two steamers, the *America* and *Esquimaux*, formerly belonging to the Dundee whaling fleet, and the *Fridtjof*, a Norwegian sailing vessel, which will not, however, proceed beyond Franz Josef Land.

The Spitsbergen Degree Measurement.—Once more the Russian and Swedish parties for the measurement of a degree on Spitsbergen have sailed to the scene of their labours, which will, it is hoped, be brought to a close during the present season. The Russians, with MM. Chernycheff and Backlund at their head, will have at their disposal, as we learn from *Petermanns Mitteilungen*, the three ships *Bakan*, *Ledokol*, and *Rurik*, while the Swedish expedition, under Prof. de Geer, has proceeded to its destination in the *Antarctic*, the ship in which Dr. Otto Nordenskiöld will afterwards sail for the Antarctic. The *Yermak* ice-breaker has also proceeded to Spitsbergen, to give any aid that may be required to the Russian party. It will afterwards sail for Novaya Zemlya, in order to investigate the possibility of finding a better route to Siberia round the north island than through the narrow passages further south.

Baron Toll's Arctic Expedition.—News from Baron Toll has been received by the St. Petersburg Academy of Sciences, stating that the expedition had safely arrived in the Gulf of Taimyr, and was wintering there. Colonel Shokalsky, who sends us the information, states that the Taimyr peninsula was reached on October 13, 1900 (old style), when an unbroken ice-barrier was encountered. The winter quarters were established in 76° 8′ N., 95° 6′ E. The coasts of the peninsula had been surveyed, and zoological, magnetic, and meteorological observations taken. The Nordenskiöld islands had been explored by Lieut. Matthiessen, who had been appointed commander of the *Zarya*, while Lieut. Kolomeitzeff had been sent to establish a coaling-station at Dudinskoe, on the Yenesei. Baron Toll hoped, himself, to make his way across the Cheliuskin peninsula in company with Lieut. Kolchak. The despatch was received by way of Yeneseisk, and was dated April 16.

Premiums Offered for News of Andrée.—We learn from *Petermanns Mitteilungen* (1901, No. 6) that premiums have been offered by Consul N. Persson, of Helsingfors, for each buoy thrown out by Andrée during his balloon voyage which may be found before the end of 1905 and forwarded to the Geographical Society at Stockholm. The amount offered is 500 kroner (£27) for each buoy containing intelligence, and 200 kroner (£11) for those without such intelligence, or for other objects belonging to the expedition. Consul Persson showed his interest in the expedition at the outset by bearing the expense of the preparation of the buoys, which have since proved their value as a means of conveying information.

The Peary Auxiliary Expedition, 1901.—Another steamer has this year been chartered by the Peary Arctic Club for the purpose of re-opening communication with the explorer, and taking up supplies for use in case the latter should be detained another winter in the north. The vessel is the *Erik*, formerly owned by the Hudson's Bay Company, but now the property of Captain Farquhar, of Halifax, N.S., a competent ice-master, with many years' experience of the waters between Halifax, Newfoundland, and Labrador. It is hoped that the *Erik* may bring home the gallant explorer, from whom nothing has been heard since March 31, 1900, at which date he was at Fort Conger, about to start on his final dash for the pole. Mrs. Peary and her daughter, who were taken up last summer by the *Windward*, and who have probably wintered at Peary's headquarters, may also be passengers, unless they have set out homewards before the arrival of the *Erik*, as may also Messrs. Stein and Warmbath of the Ellesmere Exploring Expedition, who were taken up by the *Diana* in 1899. The *Erik* left Sydney, C.B., on July 14, and would, if all went well, proceed direct to Peary's station at Etah, North Greenland.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Meteorology of the Upper Atmosphere.—Dr. Hann contributes to the *Geographische Zeitschrift* an admirable review of the monumental treatise on "Scientific Ballooning," published in three volumes by the Berlin Aeronautical Society, under the editorship of Drs. R. Assmann and A. Berson. Dr. Hann's review is really an article on the advances in knowledge of the upper strata of the atmosphere made during the last ten years as the result of the balloon ascents of the Berlin Society, and the experiments with *ballons sondes* and kites of M. Teisserenc de Bort and Mr. Lawrence Rotch. The subjects dealt with more particularly are air-temperature and its variations, aqueous vapour, wind, and atmospheric electricity. Although the results cannot be adequately summarized here, their interest and importance to meteorological science can scarcely be over-estimated, especially in their relation to existing theories of atmospheric circulation. The agreement of the extended observations with conclusions arrived at from theoretical considerations must be regarded as extremely satisfactory.

A Contribution to the Geography of Snow.—In a paper printed in No. 35 of *Leopoldina*, which, though dated 1899, has only recently been received, Prof. Paul Wagner concludes a series of investigations on the snow-covering in the mountains of Central Bavaria, based on observations carried out by the forest officers by order of the Bavarian Government. Besides giving a brief account of the last winter (1898–1899) for which the observations were made, the author presents an instructive summary of the conclusions to be based on the whole results obtained, and their general application in relation to the geography of snow. He points out first how the methods to be pursued by the geographer and agriculturist differ from those applicable to meteorology, the important point to the former being not so much the amount of the snowfall as the distribution in time of the snow-covering. In his tables he therefore shows both the number of days in each month in which such a covering exists and the average monthly and daily thickness of the snow-layer. Whereas January comes out as the month with the greatest number of days with snow on the ground, as regards the mean thickness of the covering the maximum occurs in February, thus showing that in the second half of the winter conservation plays a more important part than production. Prof. Wagner shows by a curve the average variation of the snow-layer during the winter for a series of years, bringing out in a striking way the gradual increase in thickness to the maximum in the middle of February, and

the sudden disappearance of the snow after the second third of March. This applies generally to the central highlands of Germany. Prof. Wagner also gives curves illustrating the influence of altitude and aspect on the depth and duration of the snow-layer, from which it is seen that, as might be expected, altitude has a direct influence on the depth of the covering. The aspect of the slopes plays, however, only a subordinate part in the formation of the snow-layer, though of much importance (as is also the angle of slope) in respect of its conservation. This is well shown by the increasing divergence of the curves for the different slopes, at equal elevations, as spring approaches. The last part of the paper deals with the effect of the melting of the snow on the level of the rivers, and their use for the transport of timber. The following points are emphasized: (1) The thicker the layer, and the more porous the snow, the longer is the water retained; (2) rapid floods occur only in the second half of the winter when the ground has become saturated. (3) At the first thaw rain probably has a greater effect than sunshine, as it helps to fill the interstices both in the snow and the soil. As regards the influence of forest, it is noted that a thaw accompanied by rain proceeds more rapidly in the forest than in the open, while the reverse is the case during sunshine.

A Seventeenth-century Globe.—The St. Petersburg Academy of Sciences has lately installed at Tsarskoe-selo the large globe, weighing some 3½ tons, constructed in the seventeenth century for Duke Frederick of Holstein, under the superintendence of Olearius, the celebrated astronomer and traveller, who was at the time the Duke's librarian. The globe, which is described in Marco Vincenzo Coronelli's 'Epitome Cosmografica' (Cologne, 1693), and, in recent times, by the late Prof. Fiorini in his 'Erd- und Himmelsgloben' (Leipzig, p. 83), was the work of Andreas Busch, a mechanician of Limburg. Its construction occupied from 1656 to 1674, and on completion it was placed in the Castle of Gottorp, from which fact it became known as the "Gottorp globe." The Earth is represented on the exterior, and the heavens on the interior, to which access is given by a door, a platform providing standing room for twelve persons. The globe has a diameter of 11 feet, and rotates on its axis, but is permanently adjusted to the latitude of 54½° N. It was acquired by Peter the Great and brought to Russia in 1713, being presented to the Academy in 1725. Up to the present it has remained in the Zoological Museum.

A-symmetrical River-deltas.—Prof. R. A. Daly puts forward in *Science* (June 14, 1901) a suggested explanation of the marked a-symmetry of certain river-deltas (especially that of the Mississippi), which is associated with a strong deflection (to the left in the case of that river) of the current near the mouth. He points out that the supposed influence, in the case alluded to, of the clock-wise movement of the Gulf Stream has been proved to miss the mark as an explanation, the prevailing direction of current movement being really westward, past the mouth of the river. The effect of this current on the form of the delta is traced in detail thus. Outside the river-bars aggradation of the sea-floor is progressing more rapidly on the west than on the east, and apart from the direct effect of this, the deeper water on the east is held to facilitate the yearly advance of the bars on that side. Again, the effect of the current on the bars may be supposed to weaken the latter at the left-hand extremity, where its impact is first felt, but to strengthen them on the right by the deposition of sediment. The river current of the flood season will thus break through the bar at its left-hand end, and there will be year by year a transference of the river-axis towards the left. Prof. Daly gives diagrams of the deltas of the Rhone and Ebro, showing how the same conditions are reproduced in the case of these, owing again to special conditions which cause a departure from the usual

scheme of deflection. He also refers to the deflecting action exercised by the Earth's rotation, which, as it happens, is in all three cases in the same sense as the influence attributed by him to the current. Observation is, he says, needed in order to test the theory in a set of cases where the action of the Earth's rotation would be in a contrary sense to that of the prevailing current.

GENERAL.

Distribution and Products of the Cork Oak.—An almost exhaustive monograph on the subject of the cork oak forms the concluding number for 1900 of the *Abhandlungen* of the Vienna Geographical Society. The author is Herr Eugen Müller, who has brought together from a wide literature a detailed account of the tree and its products from a botanical, geographical, and commercial point of view. The distribution of the tree is discussed both in reference to the general conditions of the soil, climate, etc., in which it flourishes, and to the regional distribution within the producing countries. Its habitat is limited to South-West Europe and North-West Africa, or roughly by the parallels of 45° and 34° N. and the meridians of 10° W. and 16° E. The tree thrives best on hill and mountain slopes of moderate elevation, for, though it ascends to an altitude of 4250 feet in Algeria and nearly 4000 feet in Spain, it is most plentiful in the former between 650 feet and 2600 feet, and in the latter between 1400 feet and 2000 feet. It thrives best in siliceous soil, and though preferring loose earth, it grows well on a rocky sub-soil. A mild climate, especially in winter, is a necessity, but of the two species (*Quercus suber* and *Q. occidentalis*) the former requires a clearer atmosphere, greater warmth, and a more sunny aspect, while the latter thrives on the vapour-clad shores of the Atlantic. A fairly high rainfall is indispensable, especially in winter, but in less degree in spring and autumn also. In north Africa, woods of cork oaks occupy the greatest extent in Algeria, and here they increase regularly from west to east in accordance with the increase in rainfall. In Europe Spain possesses the greatest area of cork woods, the tree being spread, more or less, over the whole country. The finest woods that exist occur in Catalonia, especially in the province of Gerona, which accounts for a third of all the Spanish cork woods. The tree is also distributed all over Portugal, but is limited to the south of France, the hill slopes of Lower Provence being especially productive, though the tree flourishes likewise on the sandy plains of Gascony and on the northern slopes of the Pyrenees. In Italy the cork woods have suffered much from the long prevalent forest destruction. Although known to and used by the ancients, the first traces of systematic cultivation date from the second half of the eighteenth century, the impulse in this direction being due to a German settler in the province of Gerona. In North Africa the modern extension of cultivation is the outcome of the French occupation of Algeria and Tunis. At the present time Portugal is the greatest producing country as regards quantity exported, but the value of that exported by Spain is considerably higher, owing to its better quality. Of importing countries, Great Britain takes a decided lead. The imports have steadily risen until they now stand at an annual amount of nearly 30,000 tons, with a value exceeding £900,000. The greater part is in the raw form, being used for the manufacture of linoleum.

The First Globe containing the name America.—A note in *Globus* (vol. 79, p. 307) gives, on the authority of a paper in the *Bulletin* of the Academy of Sciences at Cracau, an account of an early globe which is preserved in the Jagellon Library of the University of that city. The globe, which has been described for the first time in the publication referred to by Dr. T. Estreicher, forms part of a clock, dating from the opening years of the sixteenth century, and is made of

sheet copper. Its diameter is 29 inches. From a study of the geographical data displayed and the manner of its execution, Dr. Estreicher is of opinion that the globe must have been made between 1509 and 1511. It shows a remarkable similarity to the well-known "Hunt-Lenox" globe of New York, especially in the delineation and nomenclature of South America. In both the name "Terra Sanctæ Crucis," disused after 1511, appears in conjunction with the appellation "Mundus Novus," and both show a large island south of India and East of the southern point of Africa. This was taken by de Costa, in his description of the Lenox globe, to be an indication of Australia, but on the Cracau globe it bears the interesting inscription "America Noviter Reperta." Its east coast shows resemblances to that of South America, and the maker would thus appear to have drawn the latter continent twice over, in different places and with different names. This shows, in Dr. Estreicher's opinion, that the date of the globe must be very little after 1507, the year in which Waldseemüller bestowed the name America on the New World, the application of the name having not yet become fully established. The Cracau globe is, except the Lenox globe, the first known Post-Columbian globe, and is quite the first to show any part of the New World, to divide the same from Asia, and to apply to it the name America. Possibly, even, it may be the earliest cartographical document to contain that name. It is interesting to find, in regard to the delineation of the island above alluded to, an ambiguity parallel to that which attaches to the voyage of Gonneville; and it seems not impossible that imperfect information as to this voyage may have had something to do with the curious error on the globe.

The Livingstone Exhibition.—This exhibition, which was held at the Westminster Town Hall from June 18 to 21, under the presidency of the Right Hon. Sir George Taubman Goldie, and in connection with which Sir Clements and Lady Markham held a reception of Fellows of the Royal Geographical Society and their friends, is one among many indications of the importance of the health question to all who go abroad. Whether an expedition is contemplated to the south pole or to Central Africa, success to a considerable extent depends on the wise selection of suitable articles of outfit, and attention to the general precautions of a hygienic character, which are suggested by modern scientific research. This is the explanation of the exhibits of food and clothing, camp equipment and the like, which were on view at the Livingstone Exhibition, and of the lectures on the preservation of health which were delivered at the same time. The rapid strides which have been made in recent years in the manufacture of hygienic clothing, especially suitable to travellers, and the improved methods of preparing food products which may be kept for long periods of time and under adverse circumstances, without risk of decomposition, are matters which were illustrated in a practical way in the Westminster Town Hall, besides the innumerable devices which render the work of the modern explorer so much more easy than was the case at the beginning of the last century. Sir George Goldie pointed out in his opening speech that the exhibition was likely to have a more far-reaching result than could be obtained during the few days in which it was being held, and drew special attention to the Travellers' Health Bureau, in connection with which the exhibition had been organized, which has its offices at 133, Salisbury Square, E.C., and which exists for the purpose of collecting and disseminating information concerning the health problems of unhealthy, and particularly of tropical, climates. The Royal Geographical Society has already expressed its interest in the Bureau, not only by giving its support to the Livingstone Exhibition, but by appointing the secretary of the Bureau to be an instructor under the Society in the subjects of health and outfit. It may be mentioned that the Travellers' Health Bureau is a department of Livingstone College. The latter has

existed for the past eight years for the purpose of giving instruction to missionaries in the elements of medicine and surgery, and the new premises of the college, which were opened recently by Mrs. Bruce and other members of the Livingstone family on May 23 (*ante*, p. 94), is intended to be a permanent memorial in London to the work of Dr. Livingstone. It was for this reason that the name of Livingstone was given to the exhibition, the interest of which was enhanced by the unique collection of articles connected with Dr. Livingstone's life and work, particularly since the great explorer's daughter, Mrs. Wilson, and her husband attended each day and explained the various relics which were on view. The name of Livingstone has been happily associated with these various undertakings, seeing that he was a man universally respected, even by many who would have differed from him on certain points, and it is hoped that the Travellers' Health Bureau, with its quarterly journal *Climate*, which deals with climatic and hygienic problems from a practical point of view, may prove of service to the widely different classes of people who represent the British Empire in all parts of the world.

OBITUARY.

Admiral Sir A. H. Hoskins, G.C.B.

The Society has lost a distinguished member in the person of Admiral Sir Anthony Hoskins, who died at Pleystowe, Capel, near Dorking, on June 21 last. A son of the Rev. H. Hoskins, of North Perrot, Somerset, Sir A. Hoskins was born in 1828, and received his early education at Winchester, but entered the navy in 1842. He saw service both in East and South Africa and in China, taking part, among various actions, in the taking of the Taku forts and Tientsin in 1858. He became captain in 1863, and continued to rise rapidly in his profession, holding important commands on various stations abroad, besides doing good service at home for some years as a Lord of the Admiralty. In March, 1889, he obtained the coveted command of the Mediterranean fleet, returning home, however, in 1891 to become first naval Lord of the Admiralty, which office he held till his retirement in 1893. He had joined our Society in 1861, and served on its Council from 1897 to 1900, latterly as Vice-President.

Sir Cuthbert Peek.

We regret to announce the death, at the comparatively early age of 46, of Sir Cuthbert E. Peek, well known as a patron of scientific work, and, at our Society especially, for his active furtherance of the cause of geography. The deceased baronet joined the Society in 1875, served for a number of years on the Council of the R.G.S., and had been one of its trustees since 1895, having succeeded the late Lord Aberdare in that capacity. For the encouragement of geographical science he had, as is well known, founded an annual premium to be awarded by the Society in recognition of useful work done in the field of geography. As a traveller he was best known for his journeys in Iceland, in company with Mr. John Coles, an account of which appeared in the *Proceedings R.G.S.* for 1882. He was also much interested in astronomy and meteorology, and the useful work carried on for a number of years at his observatory at Rousden, in Devonshire, is well known to scientific men. He married, in 1884, the eldest daughter of Viscount Midleton, and leaves a numerous family.

Alexander Forrest.

The death occurred in June of Alexander Forrest, the younger of the two brothers whose names are indissolubly connected with the exploration of Western Australia. The first great expedition in which the two brothers, John and Alexander, were associated, was that undertaken in 1870, for the first time since the celebrated journey of Eyre in the opposite direction, round the head of the Great Australian Bight, the younger brother taking part in the capacity of surveyor. This expedition, which traversed the whole distance from Perth to Adelaide, led to the discovery of pastoral country within the inhospitable zone described by Eyre, in the vicinity of the coast. In 1871 Alexander Forest undertook a new expedition in search of pastoral country in the neighbourhood of Lake Lefroy, and in 1874 again accompanied his brother on the great expedition across the interior of Western Australia, which led from the headwaters of the Murchison to the Peak Telegraph Station. This expedition, in which all the difficulties inherent in such an undertaking were successfully overcome, though pack-horses were the only transport animals employed, was described in the 45th volume of the Society's *Journal*, as well as in a work afterwards published by Sir John Forrest. The younger brother continued to do good work as surveyor in Western Australia, and in 1879 led an expedition across the northern interior of the colony, discovering some of the finest pastoral country which is known to exist in that direction, as well as traces of minerals of value. Mr. Forrest joined our Society in 1872.

Edouard Foa.

The well-known French traveller, M. E. Foa (a Fellow of the Society since 1894), died on June 29 last, from an illness the germs of which, it is said, were contracted during his African journeys, as a result of the hardships still inseparable from travel in that continent. M. Foa first came into notice from his survey, with two companions, of the Whemi, the principal river of Dahome, which, until the date of the journey (1886–1889), had been practically unknown beyond a few miles from its mouth. The region of the Zambezi and Shire next attracted M. Foa's attention, and he spent several years from 1891 onwards in travelling over the little-known country between the Shire and Loangwa. After describing his adventures in two works entitled, 'A Travers l'Afrique Centrale,' 'Mes grandes chasses dans l'Afrique Centrale,' he returned to the same region, extending his explorations almost up to Bangweulu, and finally making his way to the West Coast *viâ* the Congo. The results of this journey were published only last year in a work entitled 'Du Zambèze au Congo.' Although, taken as a whole, M. Foa's journeys brought to light few geographical novelties of importance, he contributed his share to the filling in of details on our maps, and in particular did useful work in elucidating the ethnology of the countries in which he travelled.

Prof. Karl Zehden.

We regret to record the death, on May 22, of Dr. Karl Zehden, at the age of 58 years. Born at Linz in 1845, Karl Zehden studied under Sickel, Simony, and Lorenz von Hein, devoting himself specially to history, geography, and political economy. After travelling extensively in Europe and America, he was, in 1871, appointed professor of commercial geography at the Handels-Akademie, in Vienna, and in 1888 Inspector-General of technical instruction by the Department of Education. He received the title of Hofrath in 1895. Of his writings, the most important is his 'Lehrbuch der Handelsgeographie,' which has been translated into most European languages; but his great work lay in organizing and extending technical education, and his loss will be severely felt in Austrian educational circles.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1900–1901.

Thirteenth Ordinary Meeting, June 24, 1901.—Sir Clements Markham, K.C.B., President, in the Chair.

Elections.—*Daniel Elie Anderson, M.B., B.Sc., B.A.; J. Mackintosh Bell, M.A.; Captain Chas. Wm. Brebner; Ernest Chappell; Ernest Danvers; Basil Howard Aleys Hankey; Major William Harrison, 3rd N. Lancs. Regiment; Henry Felix Hertz, C.I.E.; Alfred Henry Houlder; Thomas William How, C.E.; John Ince, M.D.; Lieut.-Colonel H. S. Massy, 19th Bengal Lancers; George H. Rogers; Thos. Langdale Marwood Rose; Major-General H. L. Smith Dorrien, D.S.O.; Robert C. Stevenson; William Munro Tapp; John Chas. Ponsonby Widdup, L.R.C.S.; Rhys Williams.*

The Paper read was:—

"The Belgian Antarctic Expedition." By Henryk Arçtowski.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps—Morphology. *Globus* 79 (1901): 203–205. **Jaeger.**
Die Salzburger Bucht. Von Julius Jaeger.

Austria—House-types. *Globus* 79 (1901): 220–224. **Tetzner.**
Das bosnische und herzegowinische Haus. Von Dr. F. Tetzner. *With Illustrations.*

Austria—Moravia. *Deutsche Rundschau G.* 23 (1901): 349–357. **Trampler.**
Das "Burgverlies" im mährischen Karst. Von R. Trampler. *With Plans.*
The Burgverlies is a cavern near the small village of Holstein, south-east of Sloup.

Belgium and Holland. **Baedeker.**
Belgium and Holland, including the Grand Duchy of Luxembourg. Handbook for Travellers by K. Baedeker. Thirteenth Edition. With 14 maps and 22 plans. Leipsic: Karl Baedeker; London: Dulau & Co. 1901. Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. lxvi. and 442. *Presented by Messrs. Dulau & Co.*

Carpathians. **Martonne.**
Contribution a l'Étude de la Période Glaciaire dans les Karpates méridionales. Par E. de Martonne. (Extrait du Bulletin de la Société Géologique de la France, 1900.) Size $10 \times 6\frac{1}{2}$, pp. 275–319. *Maps. Presented by the Author.*

The results of M. de Martonne's investigations are summarized in a note on p. 84, *ante*.

Denmark—Place-names. *G. Tidskrift* **15** (1900): 153–177; **16** (1901): 3–18. **Madsen.**
Udsigt over den geografiske Udbredelse af nogle i Danmark forekommende Stednavnsklasser. Af Oberst Emil Madsen.

On the distribution in Denmark of various types of place-names.

France. *Ann. G.* **10** (1901): 216–224. **Chantriot.**
La Thiérache. Par M. Émile Chantriot.

The Thiérache is a region of gently undulating plateaux on the borders of Champagne, Picardy, Hainaut, and the Belgian Ardennes.

France—Ardennes. **Arçtowski.**
Quelques mots relatifs a l'Étude du Relief de l'Ardenne et des directions que suivent les rivières dans cette contrée. Par Henryk Arçtowski. (Extrait du Bulletin de la Société Belge de Géologie, etc., Tome xi., 1897, pp. 118–127.) Bruxelles, 1901. Size $9\frac{1}{2} \times 6\frac{1}{2}$. *Presented by the Author.*

France—Dunes. *Ann. G.* **10** (1901): 267–272. **Girardin.**
Les dunes de France. Par M. Paul Girardin.

France—Havre. *B.S.G. Com. Havre* **17** (1900): 193–218. **Hanotaux.**
Le Havre dans l'histoire de France. Par M. Gabriel Hanotaux.

France—Landes. *La G., B.S.G. Paris* (1900): 337–342, 463–483. **Hautreux.**
La côte des Landes de Gascogne. Par M. Hautreux. *With Diagrams and Maps.*

Deals principally with phenomena of the coast waters—currents, depths, temperatures, deposits, etc.

France—Roman Roads. *B.S.G. Lille* **35** (1901): 303–311. **Six.**
Coup d'œil sur le réseau des voies romaines de la région du Nord. Par Georges Six.

Germany—Bavaria. *Leopoldina* **35** (1899): 170–176. **Wagner**
Die Schneedecke im bayrischen Waldgebirge. Von Dr. Paul Wagner. *With Diagrams.*

This is referred to in the Monthly Record (*ante*, p. 218).

Germany—Harvests and Weather. **Meinardus.**
Einige Beziehungen zwischen der Witterung und den Ernte-Erträgen in Nord-Deutschland. Vortrag gehalten auf dem VII. Internationalen Geographen-Kongress in Berlin im Jahr 1899. Von Dr. Wilhelm Meinardus (Sonderabdruck aus den Verhandlungen des VII. Internationalen Geographen-Kongresses in Berlin, 1899.) Berlin, 1900. Size $10 \times 6\frac{1}{2}$, pp. 421–428. *Diagrams.*

Germany—Northern Plain. *Naturw. Wochenschrift* **16** (1901): 87–89. **Wahnschaffe.**
Prof. Dr. F. Wahnschaffe: Die Endmoränen des norddeutschen Flachlandes.

Germany—Waterways. *G.Z.* **7** (1901): 185–194. **Hochstetter.**
Die wasserwirtschaftliche Vorlage in Preussen. Von Dr. Wilhelm Hochstetter.

Greece. **Philippson.**
Beiträge zur Kenntnis der griechischen Inselwelt. Von Prof. Dr. Alfred Philippson (Dr. A. Petermanns Mitteilungen. Ergänzungsheft Nr. 134). Gotha: Justus Perthes, 1901. Size $11 \times 7\frac{1}{2}$, pp. iv. and 172. *Maps. Price* 10 *m.*

Greece. *B. American G.S.* **33** (1901): 31–35. **Richardson**
Akarnania and Ætolia. By Rufus B. Richardson.

Greece—Thessaly. **Merlin.**
Trade and Agriculture of Thessaly for the year 1900. Foreign Office, Annual No. 2557, 1901. Size $10 \times 6\frac{1}{2}$, pp. 18. *Price* $1\frac{1}{2}$*d.*

Holland—Limburg. **Loon.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 18 (1901): 394–406.
Steenkolen in Limburg. Door C. J. van Loon. *With Map.*

Hungary—Lake Balaton. ———
Resultate der wissenschaftlichen Erforschung des Balatonsees . . . Herausgegeben von der Balatonsee-Commission der Ung. Geographischen Gesellschaft. Erster Band. Physische Geographie des Balatonsees und seiner Umgebung. Fünfter Theil. Physikalische Verhältnisse des Wassers des Balatonsees. I. Section. Temperatur-Verhältnisse des Balaton-Wassers. Von Dr. Johann Sáringer. Wien: E. Hölzel, 1901. Size $11\frac{1}{2} \times 8\frac{1}{2}$, pp. 56. *Diagrams. Presented by the Hungarian Geographical Society.*

Iceland. *Petermanns M.* 47 (1901): 53–56. **Thoroddsen.**
Das Erdbeben in Island im Jahre 1896. Von Dr. Th. Thoroddsen. *With Map.*

Italy. *Atti Terzo Congresso G. Italiano, Firenze*, 1898 (vol. ii.): 11–21. **Stefani.**
Della necessità e del modo di determinare gli spostamenti del suolo in Italia. Relazione del Prof. Carlo de Stefani.

Suggestions for the investigation of earth-movements in Italy.

Italy—Florence. **Badia.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 570–577.
Pianta topografica della città di Firenze di Don Stefano Buonsignori dell' anno 1584—Memoria del Cav. Jodoco Del Badia. *With Plan.*

Italy—Glaciers. **Porro.**
Atti Terzo Conngresso G. Italiano, Firenze, 1898 (vol. ii.): 130–133.
Notizie sui lavori della Commissione eletta dal Club Alpine per lo studio dei ghiacciai italiani. Comunicazione del Prof. Francesco Porro.

Italy—Gravity. **Baglione.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 33–46.
Sulle determinazioni relative di gravità terrestre eseguite in Italia e sulla opportunità di stabilire un programma cui uniformarsi nelle ulteriori determinazioni per gli scopi geodetici e geofisici.—Memoria del Capitano del Genio P. Baglione.

Italy—Lago d'Orta. **Halbfass.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 121–124.
Dati morfometrici sul lago d'Orta—Comunicazione del Dott. Guglielmo Halbfass.

Italy—Lakes. **Agostini.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 110–20.
Sullo stato attuale degli studi batometrici dei laghi italiani coll' aggiunta di un saggio per una bibliografia limnologica italiana.—Comunicazione del Dott. Giovanni De Agostini.

Italy—Linosa. **Trabucco.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 148–162.
L'isola di Linosa. Studio geo-fisico. Memoria del Prof. G. Trabucco. *With Maps and Illustrations.*

Linosa is the small volcanic island north of Lampedusa, between Sicily and the coast of Tunis.

Italy—Place-names. **Pullè.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 331–347.
Della opportunità di compilare un dizionario toponomastico dell' Italia, sulla base principalmente della carta d'Italia dell' Istituto Geografico Militare; e del metodo e dei mezzi da impiegarsi all' uopo. Relazione del Prof. Fr. L. Pullè.

Italy—Place-names. **Ricchieri.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 642–654.
Saggi di correzione dei nomi locali nelle carte topografiche dell' Istituto Geografico Militare, per quanto riguarda la Sicilia Occidentale e Meridionale. Memoria del Prof. Giuseppe Ricchieri.

Italy—Rivers. *Atti Terzo Congresso G. Italiano, Firenze*, 1898 (vol. ii.): 25–32. **Mori.**
Sull' opportunità di procedere ad una nuova determinazione dell' area dei bacini fluviali dell' Italia e della lunghezza del percorso dei singoli fiumi. Relazioni di Attilio Mori.

Italy—River Changes. **Taramelli.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 90–102.
Di alcune delle nostre valli epigenetiche. Memoria del Professore T. Taramelli.
On examples taken from various parts of Italy of alteration in the direction of valleys due to river-capture, etc.

Italy—River-names. **Cestaro.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 632–641.
Antichi nomi dei fiumi di Romagna. Communicazione del Prof. F. P. Cestaro.

Italy—Sardinia. **Cossu.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 198–205.
Una nuova ricerca antropogeografica sull' isola di Sardegna. Distribuzione della popolazione secondo la costituzione geologica del suolo. Comuncazione di Angelo Cossu.
On the influence of physical environment on the population in Sardinia.

Italy—Sicily. **Marinelli.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 134–147.
Fenomeni analoghi a quelli carsici nei gessi della Sicilia. Memoria del Prof. Olinto Marinelli. *With Maps.*
On "karst"-like phenomena in the chalk formation of south-west Sicily.

Italy—Sicily. **Sinatra.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 103-109.
Alcune modificazioni recenti della linea di costa nella Sicilia meridionale. Comunicazione del Dott. Francesco Sinatra.

Italy—Terminology. **Battisti.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 348–360.
Intorno ad una raccolta di termini locali attinenti ai fenomeni fisici ed antropogeografici da iniziarsi nelle singole regioni dialettali d'Italia. Relazione del Dott. Cesare Battisti.

Italy—Triangulation. **Vitale.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 47–72.
Sulla triangolazioni principale d'Italia. Memoria dell' Ingegnere Geografo L. Vitale. *With Map.*

Italy—Tuscany. **Mori.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 578–631.
Come progredi la conoscenza geografica della Toscana nel secolo xix. (Contributo alla storia della Cartografia italiana.) Memoria di Attilio Mori.

Mediterranean—Pilot. ———
The Mediterranean Pilot. Vol. iv. Comprising the Archipelago, with the adjacent coasts of Greece and Turkey; including also the island of Crete or Candia. Third Edition, 1900. London: J. D. Potter, 1900. Size $9\frac{1}{2} \times 6$, pp. xxviii. and 458. *Index Chart. Price 4s. Presented by the Hydrographer, Admiralty.*

Pyrenees. *G.Z.* 7 (1901): 220–222. **Früh.**
Das Vorland der Pyrenäen. Von Prof. Dr. J. Früh.

Russia. *Mém. Comité Géolog.* **13** (1900): pp. 212. **Wissotzki.**
Les Mines d'or du District de Kotchkar dans l'oural du midi. Par N. Wyssotzky. [In Russian.] *With Maps and Illustrations.*

Russia—Murman Coast. **Knipovich.**
B.A. Imp. Sci. St. Pétersbourg **12** (1900): 419-469.
Revue sommaire des travaux de l'expédition pour l'étude scientifique et industrielle du Mourmane. Par N. Knipovitch. [In Russian.] *With Diagram.*

Russia—Odessa. **Smith.**
Agriculture of the Odessa District for the year 1900. Foreign Office, Annual No. 2548. 1901. Size $9\frac{1}{2} \times 6$, pp. 14. *Price 1d.*

Slav Race. *Atti Terzo Congresso G. Italiano, Firenze*, 1898 (vol. ii.): 655–665. **Musoni.**
Dei progressi dello Slavismo e della necessità di seriamente studiarlo anche in Italia. Memoria del Prof. Francesco Musoni.

Spain. **Harrison.**
Trade of Spain for the year 1899. Foreign Office, Annual No. 2560, 1901. Size 10 × 6½, pp. 40. *Price 2½d.*

Spain—Viticulture. **Bosdari.**
I Vini Spagnuoli. Rapporto del conte Alessandro Bosdari. (R. Ministero Affari Esteri, April, 1901.) Roma, 1901. Size 9 × 6½, pp. 40.

Sweden. *Ymer* **21** (1901): 79–91. **Andersson.**
Ett bidrag till kännedomen om hästens förekomst i Sverige under stenåldern. Af Gunnar Andersson. *With Plates.*

On remains supposed to be those of the horse, and to date from the Stone age.

Sweden. ———
Svenska Turistföreningens Årsskrift för År 1901. Stockholm: Wahlström & Widstrand. Size 8½ × 5½, pp. viii. and 462. *Illustrations.*

A description of the features of interest in Sweden from a tourist's point of view.

Sweden—Ancient Maps. *Ymer* **21** (1901): 59–78. **Lönborg.**
Om de äldsta Kartorna öfver Sverige. Af Sven Lonborg. *With Map.*

Switzerland. ———
Aperçu des résultats provisoires du recensement fédéral de la population en 1900 comparés en partie avec les données fournies par des recensements antérieurs. Berne, 1901. Size 11½ × 8½, pp. 16.

Switzerland. ———
Résultats provisoires du recensement fédéral de la population du 1er décembre 1900. Total de la population par communes. (Population de résidence ordinaire et population présente lors du recensement.) Par le bureau de statistique du Département fédéral de l'Intérieur. Bern, 1901. Size 11½ × 9, pp. 32.

Turkey—Albania. **Baldacci.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 220–230.
L'Italia e la questione albanese. Comunicazione del Dott. Antonio Baldacci.

The writer emphasizes the importance of Italian interests in Albania.

United Kingdom—Meteorology. ———
Meteorological Observations at Stations of the Second Order for the year 1897. Edinburgh: John Menzies & Co., 1900. Size 12½ × 10, pp. xiv. and 182. *Map. Presented by the Meteorological Office.*

United Kingdom—Meteorology. ———
Report of the Meteorological Council for the year ending March 31, 1900, to the President and Council of the Royal Society. London: Eyre & Spottiswoode, 1900. Size 9½ × 6, pp. 158. *Map and Diagram. Price 11½d. Presented by the Meteorological Office.*

United Kingdom—Scotland. *T. Edinburgh Geolog. S.* **8** (1901): 116–162. **Cadell.**
The Geology of the Oil Shalefields of the Lothians. By Henry M. Cadell. *With Sections.*

United Kingdom—Scotland. *T. Edinburgh Geolog. S.* **8** (1901): 91–97. **Mackie.**
Some Notes on the Distribution of Erratics over Eastern Moray. By Dr. W. Mackie.

United Kingdom—Scotland. **Smith.**
The Buried or Drift-filled Channels and Glens, and the Post-Glacial Glens of Ayrshire. By John Smith. (Reprinted from *Annals of the Andersonian Naturalists' Society*, vol. ii. part ii.) Glasgow, 1900. Size 9 × 6, pp. 51–66. *Map. Presented by the Author.*

United Kingdom—Scotland. *Blackwood's Mag.* **169** (1901): 391–400. **Stuart.**
In Hebridean Waters. By Hamish Stuart.

United Kingdom—Scotland. *Quarry* **6** (1901): 215–220, 283–288. ———
The Mineral Industry of the United Kingdom, Wigtown and Kirkcudbright. *With Map and Illustrations.*

United Kingdom—Silchester. *Archæologia* **57** (1900): 87–112. **Hope and Fox.**
Excavations on the site of the Roman city at Silchester, Hants, in 1899. By W. H. St. John Hope and George E. Fox. *With Plans and Illustrations.*

ASIA.

Armenia. **Lynch.**

Armenia, Travels and Studies. By H. F. B. Lynch. 2 vols. Vol. i. The Russian Provinces. Vol. ii. The Turkish Provinces. London: Longmans & Co., 1901. Size 10 × 6½, pp. (vol. i.) xvi. and 470; (vol. ii.) xii. and 512. *Maps, Plans, and Illustrations. Price 42s. net. Presented by the Publishers.*

A review of this important work will be given.

Central Asia. *La G., B.S.G. Paris* **3** (1901): 394–397. **Grenard.**

Voyages en Asie centrale du capitaine H. H. P. Deasy (1896–1898). Par M. F. Grenard. *With Map.*

Central Asia, etc. **Obrucheff.**

Central Asia, Northern China and Nan-Shan. Report of Journeys carried out under the orders of the Imperial Russian Geographical Society in 1892–94, by Mining-Engineer V. A. Obrucheff. Vol. ii. Route Journals relating to Central Mongolia, Dzungaria, and the mountain systems of the Be-shan, Nan-Shan, Eastern Tian-Shan and Tzin-lin-Shan. [In Russian.] St. Petersburg, 1901. Size 12 × 9, pp. xxvi. and 686. *Maps and Plates. Presented by the Imperial Russian Geographical Society.*

Central Asia—Sea of Aral. *Globus* **79** (1901): 213–215. **Seidlitz.**

L. S. Bergs Erforschung des Aralsees im Sommer 1900. Von N. V. Seidlitz.

This is referred to in the Monthly Record (*ante*, p. 86).

Ceylon—Cinnamon. **Hartwich.**

Vierteljahrs. Naturforsch. Ges. Zürich **45** (1900): 199–204.

Ueber den Ceylon-Zimmt. Von C. Hartwich.

China. *B. Comité l'Asie Française* **1** (1901): 28–36. **Bidou.**

La pénétration russe en Chine. Par M. Henry Bidou. *With Map.*

China. **Parsons.**

An American Engineer in China. By Wm. Barclay Parsons. New York: McClure, Phillips & Co., 1900. Size 8 × 5½, pp. 322. *Illustrations. Presented by the Author.*

An interesting study of Chinese questions, especially in reference to industrial development, based on a journey across Hunan for railway survey purposes in 1898–99. Although the conclusions were to a large extent formed before the recent troubles began, they still hold good in great measure, and the book may be recommended as offering a clear insight into the factors of the Chinese problem.

China—Singan-fu. **Obrucheff.**

The new capital of China and the routes to it from the shores of the Yellow Sea. By V. A. Obrucheff. [In Russian.] Size 10 × 6½. *Map.*

Chinese Empire—Gobi. *Petermanns M.* **47** (1901): 90–94. **Krahmer.**

Nachrichten von der Expedition P. K. Koslows. Von Gen. Krahmer.

An outline of Kozloff's expedition was given in the *Journal* for March (p. 303).

Dutch East Indies. **Van der Chijs.**

Nederlandsch-Indisch Plakaatboek, 1602–1811. Door Mr. J. A. Van der Chijs. Zeventiende Deel. Batavia, 1900. Size 8½ × 5½, pp. xliv. and 736.

A classified list of the documents contained in the previous sixteen volumes, with an alphabetical index to subjects.

Eastern Asia. **Hitchcock.**

Our trade with Japan, China, and Hongkong, 1889–1899. By Frank H. Hitchcock. (U.S. Department of Agriculture. Section of Foreign Markets. Bulletin No. 18.) Washington, 1900. Size 9 × 6, pp. 168.

French Indo-China. *B.S.G. Com. Paris* **23** (1901): 28–39. **Barthélemy.**

Un voyage chez les Moïs Stiengs, vivant au pied de la chaîne du Djambra. Par le C^te P. de Barthélemy. *With Map.*

French Indo-China—Annam. *B.S.G. Com. Paris* **22** (1900): 258 *bis*—270 *bis*. **Hauser.**

L'Annam central et la colonisation. Par M. Félix Hauser.

French Indo-China—Tonkin. *Rev. G.* **48** (1901): 283–299. **Massieu.**

Les territoires militaires du Tonkin. Par M^me Isabelle Massieu.

India. ——

List of Proceedings, etc., India, 1859–1898. Preserved in the Record Department of the India Office, London. London: Printed by Eyre & Spottiswoode, 1900. Size 13 × 8½, pp. 128.

India—Assam. ——

Returns of the Rail and River-borne Trade of the Province of Assam for the quarter ending March 31, 1900. Shillong, 1900. Size 13½ × 8½, pp. 130.

India—Forestry. *Nature* **63** (1901): 597–601. **Brandis.**

Indian Forestry. By Sir Dietrich Brandis, F.R.S.

India—Kashmir. **Donsen.**

Tijds. K. Ned. Aard. Genoots. Amsterdam **18** (1901): 416–462.

Klein-Tibet. Door M. Donsen.

India—Kolar Goldfield. *Mem. Geolog. Surv. India* **33** (1901): 1–18. **Hatch.**

The Kolar Goldfield, being a description of Quartz-Mining and Gold-Recovery as practised in India. By F. H. Hatch, PH.D. *With Map, Plan, and Plates.*

India—Madras. *J.S. Arts* **49** (1901): 469–488. **Rees.**

Madras, the Southern Satrapy. By J. D. Rees.

Indian Ocean—Seychelles. **Murat.**

Gordon's Eden; or, the Seychelles Archipelago. By M. Murat. Mauritius, 1900. Size 7½ × 5, pp. 26.

A short sketch of the geography, trade, and history of the Seychelles.

Japan—Formosa. **Kenny.**

Trade of Tainan for the year 1899. Foreign Office, Annual No. 2544, 1901. Size 9½ × 6, pp. 28. *Price 2d.*

Malay Archipelago—Bali. **Schwartz.**

Tijds. Indische Taal-, Land- en Volkenk. **43** (1900): 108–131.

Dagverhaal van eene reis van den resident van Bali en Lombok, vergezeld van den controleur voor de politieke aangelegenheden en de poenggawa's Ida Njoman Bandjar en Goesti Njoman Raka naar Karangasem en Kloengkoeng van 11 t/m 26 April 1898. *Map.*

Rapport van de Reis van den controleur Schwartz naar Bangli. *Map.*

Malay Archipelago—Bali. ——

Tijds. Indische Taal-, Land- en Volkenk. **43** (1900): 132–158.

Dagverhaal van eene reis van den resident van Bali en Lombok vergezeld van den controleur voor de politieke aanrakingen en de poenggawa's Ida Bagoes Gelgel en Goesti Ktoet Djlantik naar Tabanan en Badoeng, van 17 Juli t/m 5 Augustus 1899. *With Map and Table.*

Malay Archipelago—Borneo. **Molengraaf.**

Borneo-Expeditie. Geologische Verkenningstochten in Centraal-Borneo (1893–94). Door Dr. G. A. F. Molengraaff. With Atlas. Leiden: E. J. Brill, 1900. Size 11½ × 7½, Atlas, 19½ × 13½, pp. xxii., 530, and 56. *Maps and Illustrations.*

Malay Archipelago—Borneo. **Nieuwenhuis.**

In Centraal Borneo. Reis van Pontianak naar Samarinda door Dr. A. W. Nieuwenhuis. 2 vols. Leiden: E. J. Brill, 1900. Size 10 × 7, pp. (vol. i.) viii. and 308; (vol. ii.) viii. and 370. *Illustrations. Price 30s.*

These important works will be specially noticed.

Malay Archipelago—Borneo. **Nieuwenhuis.**

Tijds. K. Ned. Aard. Genoots. Amsterdam **18** (1901): 383–393.

Mededeelingen over eene Commissie-reis naar Centraal-Borneo. Door Dr. A. W. Nieuwenhuis.

Malay Archipelago—Java. **Brandes.**

Tijds. Indische Taal-, Land- en Volkenk. **43** (1900): 1–35.

Van oud-Batavia, losse mededeelingen (eerste reeks). Door Dr. J. Brandes.

Continuation of a previous article.

Malay Archipelago—Sumatra. *Die Natur* **50** (1901): 86–90. **Philippi.**

Eine Schöpfung deutscher Elektrotechniker im Urwald von Sumatra. Nach einem Aufsatze von Ober-Ingenieur Philippi. *With Illustrations.*

An account of the installation of electricity, generated by water-power, at the gold-mines of Rejang Lebong.

Persia—Historical. *J.R. Asiatic S.* (1901): 281–290. **Le Strange.**
The Cities of Kirmān in the time of Hamd-Allah Mustawfi and Marco Polo. By Guy le Strange.

Philippine Islands. **Walsh.**
Science in the Philippines. A review by James J. Walsh, PH.D. [New York, 1901.] Size 10 × 7, pp. 14. *Illustrations.*

Review of the account of the Philippines compiled by the Jesuits at Manila, and recently issued by the Government press at Washington.

Portuguese Colonies. *Questions Dipl. et Colon.* **11** (1901): 471–477. **Hauser.**
Colonies portugaises d'Extrême-Orient. Par Henri Hauser.

Russia—Caucasia. *Rev. G.* **48** (1901): 300–315, 370–396. **Baye.**
Chez les Tatars; de Derbent à Élisabethpol. Souvenirs d'une mission. Par Baron de Baye. *With Illustrations.*

Turkey. **Percy.**
Highlands of Asiatic Turkey. By Earl Percy, M.P. London: E. Arnold, 1901. Size 9 × 6, pp. x. and 332. *Maps and Illustrations. Price* 14*s. net. Presented by the Publisher.*

This will be specially noticed.

Turkey—Rhodes. *Petermanns M.* **47** (1901): 59–61. **Philippson.**
Geologie von Rhodus. Von Prof. Dr. A. Philippson.

AFRICA.

Algeria. **Randall-Maciver and Wilkin.**
Libyan Notes. By David Randall-Maciver and Anthony Wilkin. London: Macmillan & Co., 1901. Size 13 × 10, pp. viii. and 114. *Illustrations. Price* 20*s. net.*

This volume gives the results of archæological researches in Algeria carried out in 1900 with a view to throwing light on the question of the early connection between the Berbers and Egyptians. The character of the country visited and the life and industries of the inhabitants are also described, and a large series of anthropometric data and photographs of native types supply matter of much value to the anthropologist. The general result of the investigation has been to show that Libya and Early Egypt were not united by any ties of race.

Algeria. *A travers le Monde, Tour de Monde* **7** (1901): 153–156. ——
Excursions aux gisements de phosphates de Tébessa. *With Map and Illustrations.*

Angola. *A travers le Monde, Tour du Monde* **7** (1901): 137–140. ——
Les Progrès de la Colonie portugaise d'Angola. *With Map and Illustrations.*

British South Africa—Southern Rhodesia. ——
British South Africa Company. Information for Intending Settlers in Southern Rhodesia. 1901. Size 8½ × 5½, pp. 38. *Illustrations. Presented by the British South Africa Company.*

Central Africa. **Moore.**
To the Mountains of the Moon. Being an account of the modern aspect of Central Africa, and of some little-known regions traversed by the Tanganyika Expedition, in 1899 and 1900. By J. E. S. Moore. London: Hurst & Blackett, 1901. Size 9 × 6½, pp. xvi. and 350. *Maps and Illustrations. Price* 21*s. net. Presented by the Author.*

This will be noticed among reviews of African books.

Comoro Islands. **Repiquet.**
Le Sultanat d'Anjouan (Iles Comores). Par Jules Repiquet. Paris: A. Challamel, 1901. Size 8 × 5½, pp. 138. *Map and Illustrations. Price* 2*s.* 8*d.*

A systematic account of the geography, ethnology, and history of the island of Johanna.

Congo—Rubber. *B.S. d'Études Colon.* **8** (1901): 256–266. **Wildeman.**
Quelles sont les plantes qui produisent les divers caoutchoucs du Congo. Par E. de Wildeman.

Egypt. **Alban.**
Trade of Egypt for the year 1899 and half of 1900. Foreign Office, Annual No. 2549, 1901. Size 9¼ × 6, pp. 44. *Price* 2½*d.*

Egypt. **Grenfell, Hunt, and Hogarth.**
Egypt Exploration Fund: Græco-Roman Branch. Fayûm Towns and their Papyri. By Bernard P. Grenfell, Arthur S. Hunt, and David G. Hogarth. With a Chapter by J. Grafton Milne. London: Offices of the Egypt Exploration Fund, etc., 1900. Size $10\frac{1}{2} \times 8$, pp. xvi. and 374. *Map and Plates. Presented by D. G. Hogarth, Esq.*

Part i. gives a valuable sketch of the ancient geography of the Fayum, followed by an account of the discovery of papyri throwing light on the past history of the region. Part ii. deals with the results of recent excavations, while in Part iii. the documents are described and their text reproduced.

Egypt. **Beadnell.**
Recent Geological Discoveries in the Nile Valley and Libyan Desert. By Hugh J. L. Beadnell. (An English translation of a paper communicated to the International Congress, Paris, 1900.) Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 24. *Map. Presented by the Author.*

This is the complete version of the paper of which an abstract was noticed in the *Journal*, vol. xvii. p. 527.

Egypt. *Questions Dipl. et Colon.* **11** (1901): 451–470. **Brunhes.**
De quelques formes spéciales de la pénétration anglaise en Égypte. Par Jean Brunhes.

Deals with the extension of British influence through such means as the irrigation service, the schools, and the employment of capital.

Egypt—Arabian Desert. *B.S. Khédiv. G.* **5** (1900): 515–577. **Fourtau.**
Voyage dans la partie septentrionale du désert arabique. Par M. R. Fourtau. *With Map.*

The author's itineraries have supplied new matter for the cartography of the little-known plateaux of the Galala el Baharieh and Galala el Kiblieh, west of the gulf of Suez.

French Guinea. *B.S.G. de l'Est* **21** (1900): 407–423. **Courtet.**
En Casamance. Par E. Courtet. *With Map.*

French Sudan. *Rev. G.* **48** (1901): 255–282, 345–369. **Dornin.**
Dans le nord du Soudan français. Par Pierre Dornin. *With Maps and Illustrations.*

A well-illustrated account of a voyage up the Senegal and down the Niger to Timbuktu.

German East Africa. **Hollis.**
Report on German East Africa for the year 1900. Foreign Office, Annual No. 2568, 1901. Size $9\frac{1}{2} \times 6$, pp. 50. *Price 3d.*

Gold Coast—Ashanti. **Biss.**
The Relief of Kumasi. By Captain Harold C. J. Biss. London: Methuen & Co., 1900. Size $8 \times 5\frac{1}{2}$, pp. xiv. and 316. *Map and Illustrations. Price 6s. Presented by the Publishers.*

A well-told narrative of the operations for the relief of Kumasi, from the writer's personal experience, supplemented from that of other officers. The introduction gives a summary of the recent history of British West Africa, while the map is reduced from that published by the Intelligence Division of the War Office.

Ivory Coast. *La G., B.S.G. Paris* **3** (1901): 311–315. **Clozel.**
Bingerville, la nouvelle capitale de la côte d'Ivoire. Par M. Clozel. *With Map and Plan.*

Kamerun. *Globus* **79** (1901): 133–135. **Hutter.**
Wirtschaftliche Bedeutung von Nordkamerun insbesondere der Hochlandsgebiete. Von Hauptmann Hutter.

Natal—Mines. ——
Colony of Natal. Supplement to the Report on the Mining Industry of Natal, 1899. Pietermaritzburg, 1900. Size 13×8.

Consists of illustrations of geological sections.

Nile and Zambezi. *J. R. Colonial I.* **32** (1901): 157–176. **Gibbons.**
The Nile and Zambezi Systems as Waterways. By Major A. St. Hill Gibbons.

The author goes more at length, than in the paper read before the Society, into the

possibilities of navigation on the Zambezi and Nile, and the commercial importance of their utilization.

North-East Africa. **Vannutelli.**

Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. i.): 221–236.

Intorno all' ultima spedizione Bòttego. Conferenza del tenente di vascello Lamberto Vannutelli.

Portuguese East Africa. *Questions Dipl. et Colon.* **11** (1901): 83–103. **Hauser.**

Études sur les colonies portugaises.—III. Moçambique. Par Prof. H. Hauser. *Map.*

Sahara. **Honoré.**

Maurice Honoré. Le Transsaharien et la pénétration française en Afrique. Paris: A. Pedone, 1901. Size 9 × 6, pp. 144. *Map. Presented by the Author.*

A historical *résumé* of the question of the Trans-Saharan Railway Project, with a bibliography. The author is cautious in expressing an opinion as to the value of such a line.

Sahara. *La G., B.S.G. Paris* **3** (1901): 257–260. **Lapparent.**

La trouvaille d'un oursin fossille dans le Sahara. Par A. de Lapparent.

On the recent determination as belonging to the *Echinidæ* of a fossil (*Noetlingia Monteili*) found by Monteil near Bilma. The writer points out the importance of this discovery of the remains of a marine animal in connection with the geological history of the Sahara.

Sahara and Sudan. *B.S.G. Com. Paris* **23** (1901): 7–27. **Foureau.**

De l'Algérie au Congo français, par l'Aïr et le Tchad. Par F. Foureau. *Map.*

Spanish West Africa. *B.R.S.G. Madrid* **2** (1901): 12–18. **[Sobral.]**

Guinea española.—La crisis ne braceros.—Krumanes, Kukis y Pamues.—Fertilidad de los territorios españoles.—Explotación de sus riquezas.—Errores del fisco.

Tunis. *B.S.G. Marseille* **24** (1900): 373–383. **Causeret.**

Voyage en Tunisie, la colonisation, conférence de M. Ch. Causeret.

Tunis. *B.S.G. de l'Est* **21** (1900): 230–237, 377–406. **Saurin.**

L'invasion sicilienne et le peuplement français de la Tunisie. Par M. J. Saurin.

West Africa. **Kingsley.**

West African Studies. By Mary H. Kingsley. Second Edition, with additional chapters. London: Macmillan & Co., 1901. Size 8½ × 5½, pp. xxxii. and 508. *Portrait, Map, and Illustrations. Price 7s. 6d. Presented by the Publishers.*

A popular edition, similar to that previously issued of Miss Kingsley's 'Travels in West Africa.' The appendices to the original edition are omitted, and their place taken by various lectures and articles of a date subsequent to the first appearance of the book. The volume, though compact, is well printed, and the publishers have done good service in placing it within the reach of a wide circle of readers.

West Africa—Boundaries. *B.R.S.G. Madrid* **2** (1901): 7–11. ———

Africa española. Convenio especial celebrado entre España y Francia para la delimitación de las posesiones de ambos paises en el Africa Occidental.

NORTH AMERICA.

Alaska. **Abercrombie.**

Alaska. 1899. Copper River Exploring Expedition, Captain W. R. Abercrombie, commanding. Washington, 1900. Size 9½ × 6, pp. 170. *Map and Plates. Presented by the United States Government.*

This will be noticed with other works on Alaskan Exploration.

Alaska. **Elliot.**

Description of an apparently new species of Mountain Goat. By D. G. Elliot. (Field Columbian Museum, Publication 46. Zoological Series, vol. iii. No. 1.) Chicago, 1900. Size 9½ × 6½, pp. 6. *Illustrations.*

The head of this mountain goat was obtained from an Indian in Alaska in 1899.

Alaska. *National G. Mag.* **12** (1901): 180–196. **Gannett.**

The General Geography of Alaska. By Henry Gannett. *With Illustrations.*

Alaska. **Glenn and Abercrombie.**

Reports of Explorations in the Territory of Alaska (Cooks Inlet, Sushitna, Copper, and Tanana Rivers). 1898. Made under the direction of the Secretary of War

by Captain Edwin F. Glenn and Captain W. R. Abercrombie. July, 1899. Washington, 1899. Size 9 × 6, pp. 464. *Map. Presented by the United States Government.*

An account of the work of the two army expeditions of 1898.

Alaska. *Mazama* **2** (1901): 70–74. **Kincaid**

Harriman Alaska Expedition. By Trevor Kincaid. *With Illustrations.*

Alaska. ———

Compilation of Narratives of Explorations in Alaska. Washington, 1900. Size 12 × 9, pp. viii. and 856. *Maps and Illustrations. Presented by the United States Government.*

A valuable series of reports on exploring expeditions sent out to Alaska by the United States War Department, from 1869 (Raymond's expedition) to 1899.

Alaska—Cape Nome. *B.S.G. Com. Paris* **22** (1900): 320–331. **Schneider.**

Au Cap Nome. Par M. Schneider. *With Illustrations.*

Mexico—Cedros Island. *B. American G.S.* **33** (1901): 64–66. **Eisen**

Cerros, or Cedros Island. A Note by Gustav Eisen, PH.D.

The writer gives his verdict in favour of the form Cedros as the name of this island, discovered in 1539 by Francisco de Ulloa.

Mexico—Colonization. **San Marco.**

La Colonizzazione nel Messico. Le Colonie Agricole Italiane. Rapporto del conte Roberto di Villar San Marco. (B. Ministero Affari Esteri, Marzo, 1901.) Roma, 1901. Size 9 × 6½, pp. 20.

Mexico—Tacubaya Observatory. ———

Anuario del Observatorio Astronómico Nacional de Tacubaya para el Año de 1901. Año xxi. México, 1901. Size 7 × 5, pp. 362.

Mexico—Yucatan. **Peirce.**

Trade of Yucatan for the year 1900. Foreign Office, Annual No. 2556, 1901. Size 10 × 6, pp. 6. *Price ½d.*

Rocky Mountains. *Z. Ges. Erdk. Berlin* **36** (1901): 1–19. **Deckert.**

Die Hochketten des nordamerikanischen Felsengebirges und der Sierra Nevada. Von Dr. Emil Deckert. *With Plates.*

United States—Agricultural Imports. **Hitchcock.**

Sources of the Agricultural Imports of the United States, 1894–1898. By Frank H. Hitchcock. (U.S. Department of Agriculture. Section of Foreign Markets, Bulletin No. 17.) Washington, 1900. Size 9 × 6, pp. 118. *Presented by the U.S. Department of Agriculture.*

United States—Beet Sugar. **Wyndham.**

Beet Sugar Industry in the United States. Foreign Office, Miscellaneous No. 548, 1901. Size 10 × 6½, pp. 8. *Price ½d.*

United States—California. *P. California A. Sci., Geology* **1** (1900): 261–322. **Turner.**

The Pleistocene Geology of the South Central Sierra Nevada, with especial Reference to the Origin of Yosemite Valley. By Henry Ward Turner. *With Plates.*

United States—Coosa River. *B. American G.S.* **33** (1901): 67–72. **Bromberg.**

The Coosa River. By Frederick G. Bromberg.

The Coosa river took an important place early in the nineteenth century in schemes for an interior water-route between the Atlantic and the Gulf of Mexico.

United States—Irrigation. *B. American G.S.* **33** (1901): 73–80. **Brigham.**

Notes on the Recent Progress of Irrigation in the United States. By A. B. Brigham.

United States—New Jersey. **Harshberger.**
P.A. Nat. Sci. Philadelphia (1900): 623–671.

An Ecological Study of the New Jersey Strand Flora. By John W. Harshberger, PH.D.

United States—New Jersey. *P.A. Nat. Sci. Philadelphia* (1900): 544–549. **Saunders.**

The Pine Barrens of New Jersey. By C. F. Saunders.

United States—Pennsylvania. **MacElwee.**
P.A. Nat. Sci. Philadelphia (1900): 482–490.
The Flora of Edgehill Ridge near Willow Grove, and its Ecology. By Alexander MacElwee.

CENTRAL AND SOUTH AMERICA.

Argentine Republic. *B.S.G. Com. Paris* **22** (1900): 294–314. **Daireaux.**
Évolution économique et sociale de la République Argentine depuis dix ans. Par M. Émile Daireaux.

Argentine Republic. *Kolon. Z.* **2** (1901): 104–109. **Lhiez.**
Esperanza de Santa Fé, die erste Ackerbaukolonie Argentiniens. Von S. Lhiez. *With Illustrations.*

Argentine Republic—Provincial Boundaries. ——
B.A. Nac. Ci. Cordoba **16** (1900): 293–348.
Antecedentes y documentos de la demarcacion de limites entre las provincias de Córdoba y La Rioja. *With Plan.*

Bolivia—Cochabamba. **Haënke, Romero and Ballivian.**
Introduccion a la Historia natural de la Provincia de Cochabamba. Estudios inéditos del esplorador Don Tadeo Haënke. Compilados y anotados por B. D. Romero y J. A. Ballivian. La Paz, 1900. Size $8\frac{1}{2} \times 5\frac{1}{4}$, pp. viii. and 118. *Presented by the Geographical Society of La Paz, Bolivia.*

Bolivia and Chile. **Valdés.**
Bolivia y Chile. Antecedentes históricos. Discusión Diplomática. Estado actual de la cuestión. Por J. C. Valdés. Santiago de Chile, 1900. Size 7 × 5, pp. viii. and 232.

A statement of facts bearing on the territorial question between Bolivia and Chile.

Brazil. **Branner.**
Results of the Branner-Agassiz Expedition to Brazil. IV. Two Characteristic Geologic Sections on North-East Coast of Brazil. By John C. Branner. (P. Washington A. Sci., vol. ii. pp. 185–201, August 20, 1900.) Washington, 1900. Size 10 × 7. *Maps and Illustrations.*

Brazil. **Branner.**
The Manganese Deposits of Bahia and Minas, Brazil. By Prof. John C. Branner. A Paper presented to the American Institute of Mining Engineers at its California Meeting, September, 1899. Author's Edition, 1899. Size 9 × 6, pp. 16. *Illustrations.*

Brazil. **Branner.**
The Oil-bearing Shales of the Coast of Brazil. By John C. Branner. A Paper read before the American Institute of Mining Engineers at the Canadian Meeting, August, 1900. Author's Edition, 1900. Size $9\frac{1}{2} \times 6$, pp. 18. *Map and Illustrations. Presented by the Author.*

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Ditto. Second Mémoire du Brésil. 6 vols. Vol. v. Facsimile de quelques documents reproduits aux Tomes ii., iii. et iv.—Vol. vi. Atlas. Berne: Stæmpli & Cie, 1899. (Vol. vi. Paris: A. Lahure.) Size $10\frac{1}{2} \times 7\frac{1}{2}$; vol. v., $19 \times 12\frac{1}{2}$; vol. vi., $22\frac{1}{2} \times 16$; pp. (vol. i.) xviii. and 232; (vol. ii.) xvi. and 528; (vol. iii.) xvi. and 402; (vol. iv.) xii. and 294. *Maps and Facsimiles. Presented by the Brazilian Government.*

These collections of documents respecting the frontier between French Guiana and Brazil contain matter of much value for the early history of those parts.

British Guiana Boundary. *B.S.G. de l'Est* **21** (1900): 325–356. **Pariset.**
L'arbitrage anglo-vénézuélien de Guyane. Par M. G. Pariset.

Dutch Guiana. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **18** (1901): 367–382. **Heldring.**
Surinaamsche belangen. Door E. Heldring.

Peru. **Balta.**
Ensayos sobre La Geología del Perú. Por J. Balta. Size 10 × 7, pp. 12. *Map. Presented by the Author.*

This note deals with the Carboniferous system of Peru.

South America. **Church.**
South America: an Outline of its Physical Geography. By Colonel George Earl Church. (From the *Geogr. Journal* for April, 1901.) Size 10 × 6½, pp. 78. *Maps.*

South America. **Godio.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 231–238.
L'Italia come fattore etnico ed economico nello sviluppo dell' America Meridionale. On the part played by Italy in the development of South America.

AUSTRALASIA AND PACIFIC ISLANDS.

Australasia. **Coghlan.**
A Statistical Account of the Seven Colonies of Australasia, 1899–1900. By T. A. Coghlan. Eighth Issue. Sydney, 1900. Size 9 × 6, pp. 836. *Map.*

Australia. *Fortnightly Rev.* 69 (1901): 969–988. **Posnett.**
The Federal Constitution of Australia. By Professor H. Macaulay Posnett, LL.D.

Australia. *P.R.S. Queensland* 16 (1901): 39–44. **Shirley.**
Australian Vegetation and its Geological Development. By John Shirley, B.SC.

Australia—Directory. ——
Supplement, 1900, relating to the Australia Directory, vol. ii. Fifth Edition, 1898. London: J. D. Potter, 1900. Size 9½ × 6½, pp. 40. *Presented by the Hydrographer, Admiralty.*

New South Wales. ——
New South Wales: Statistics, History, and Resources. Compiled by the Editor of the Year-Book of Australia. 1901. Size 8½ × 5½, pp. 168. *Map. Presented by the Agent-General for New South Wales.*

New South Wales—Meteorology. **Russell.**
Results of Meteorological Observations in New South Wales during 1898. By H. C. Russell, C.M.G., etc. Sydney, 1900. Size 9½ × 6½, pp. 72.

New South Wales—Trawling Expedition. ——
Scientific Results of the Trawling Expedition of H.M.C.S. *Thetis*, off the coast of New South Wales, in February and March, 1898. Part 3. (Australian Museum, Sydney. Memoir iv.) Sydney, 1901. Size 10 × 6, pp. 203–246. *Illustrations. Presented by the Australian Museum.*

Pacific Islands. ——
Pacific Islands, vol. ii. (Central Groups). Sailing directions for Fiji, Tonga, Samoa, Union, Phœnix, Ellice, Gilbert, Marshall Islands; New Caledonia, Loyalty, New Hebrides, Banks, Torres, and Santa Cruz Islands. Third Edition. London: J. D. Potter, 1900. Size 9½ × 6, pp. xxx. and 566. *Index Charts. Price 6s. Presented by the Hydrographer, Admiralty.*

Queensland—Coal Measures. **Dunstan.**
Report on the Permo-Carboniferous Coal Measures of Clermont and associated formations. By B. Dunstan. Brisbane, 1900. 13¼ × 8½, pp. 18. *Map and Plans.*

Samoa. *B. Union G. Nord de la France* 21 (1901): 158–171. **Lavoix.**
La Religion païenne aux Îles Samoa, notes traduites par M. Jean Lavoix.

Solomon Islands. *Deutsch. Kolonialblatt* 12 (1900): 113–117. **Bennigsen.**
Ueber eine Reise nach den deutschen und englischen Salomons-Inseln. Von Gouverneur *v.* Bennigsen.

Tonga Islands. *J. B. Linnean S. (Botany)* 35 (1901): 20–65. **Burkill and Crosby.**
The Flora of Vavau, one of the Tonga Islands. By J. H. Burkill, with a short account of its vegetation. By C. S. Crosby.

Western Australia. *La G., B.S.G. Paris* 3 (1901): 279–286. **Garnier.**
L'ancien "désert Victoria" (Australie occidentale). Par Jules Garnier. *With Illustration.*

Western Australia. *B. Union G. Nord de la France* 21 (1900): 129–157. **Kuss.**
Une excursion en Australie. Par M. H. Kuss.
Deals chiefly with the gold-fields of Western Australia.

POLAR REGIONS.

Antarctic—Belgian Expedition. **Arçtowski.**
Aperçu sur les Observations Météorologiques de l'Expédition Antarctique Belge. Communication faite au VII^{ème} Congrès International de Géographie à Berlin en 1899. Par M. Henryk Arçtowski. (Sonderabdruck aus den Verhandlungen des VII. Internationalen Geographen-Kongresses in Berlin, 1899.) Berlin, 1900. Size 10 × 7, pp. 648–651.

Antarctic—Belgian Expedition. *B.S.G. Romînă* **21** (1900): 59–82. **Racovitza.**
Expedițiunea Antarctică Belgiană. Conferință de Emil. G. Racoviță, Naturalistul Expedițiunei. *With Map and Plates.*

Antarctic—Bellingshausen's Voyage. *B. American G.S.* **33** (1901): 36–41. **Cook.**
Captain Fabian Gottlieb von Bellingshausen, 1819–1821. The Discovery of Alexander I., Peter I., and other Islands. By F. A. Cook.

Antarctic—British Expedition. *Nature* **63** (1901): 609–612. **Gregory.**
The Work of the National Antarctic Expedition. By Prof. J. W. Gregory. *Map.*

Arctic—Abruzzi Expedition. *Rev. G.* **48** (1901): 463–469. ———
L'expédition du duc des Abruzzes au pôle Nord, en 1899–1900. Par G. N. *Map.*

Based on the addresses of the Duke and Captain Cagni at the Italian Geographical Society, and notes furnished by Prof. Grifoni.

Arctic—Andrée's Expedition. *Ymer* **21** (1901): 92–95. **Nathorst.**
Atgärder för tillvaratagande af föremål fraå Andrée-expiditionen. Af A. G. Nathorst.

On steps which have been taken to secure the preservation of any objects from Andrée's expedition which may be found in Greenland, Iceland, Norway, or elsewhere.

Arctic—Bear Island. *Ymer* **21** (1901): 35–58. **Andersson.**
Några drag af Beeren Eilands Kolonisationshistoria. Af J. G. Andersson. *With Sketch-map and Plan.*

Arctic—Canadian Expedition. *J.R. Colonial I.* **32** (1901): 177–181. **Bernier.**
A Canadian Polar Expedition. By Captain J. E. Bernier.

Arctic—Norwegian Expedition. *Nautical Mag.* **70** (1901): 233–245. **Plumstead.**
The Norwegian Polar Expedition, 1893–1896. By E. Plumstead. [Also separate copy, presented by the Author.]

An examination of the recently published 'Scientific Results' of the voyage in the direction of astronomical determination of position.

Arctic Expeditions. **Payart.**
Proposition d'Expeditions Polaires Arctiques, Internationales et Simultanées. Communication faite au VII^{ème} Congrès International de Géographie à Berlin en 1899. Par E. Payart. Berlin, 1900. Size 10 × 6½, pp. [4].

Exploration. **Lapparent.**
Vers les Poles. Par A. de Lapparent. [Extrait du *Correspondant.*] Paris, 1901. Size 9½ × 6, pp. 30.

On recent polar exploration.

Greenland. *Öfversigt K. Vet. A. Förhand. Stockholm* **57** (1900): 763–787. **Åkerblom.**
Positions géographiques déterminées par des observations astronomiques faites pendant l'expédition suédoise au Grönland en 1899. Par Filip Åkerblom.

Dr. Åkerblom accompanied Dr. Nathorst in his expedition to East Greenland (*Journal*, vol. xvii. p. 48).

Spitsbergen. *Öfversigt K. Vet. A. Förhand. Stockholm* **57** (1900): 99–130. **Arnell.**
Beiträge zur Moosflora der Spitzbergischen Inselgruppe. Von H. W. Arnell.

Spitsbergen. *La G., B.S.G. Paris* **3** (1901): 287–296. **Backlund.**
Mesure d'un arc de méridien au Spitzberg. Historique général et travaux des missions russes. Par O. Backlund. *With Map and Illustrations.*

Spitsbergen. *La G., B.S.G. Paris* **3** (1901): 297–302. **Chernychev.**
Relation des opérations de la mission russe pendant l'hiver 1899–1900 et l'été 1900. Résumé du rapport de M. Tchernychev.

Spitsbergen. **Carlheim-Gyllenskōld.**
Öfversigt K. Vet. A. Förhand. Stockholm **57** (1900): 499–515.
Travaux de l'expedition suédoise au Spitzberg en 1898, pour la mesure d'un arc du méridien.

Full details of the geodetic operations in northern Spitzbergen in 1898.

Spitsbergen. *Ymer* **21** (1901): 29–34. **Kjellström.**
En exkursion för uppmätining af Van Wijens bay under 1898 års svenska polarexpedition. Af C. J. Otto Kjellström. *With Map.*

Van Mijen's bay is the Klok bay of Sir Martin Conway, the northern branch of Bell sound.

Spitsbergen. *La G., B.S.G. Paris* **3** (1901): 303–310. **Rabot.**
Résumé des travaux des missions suédoises pour la mesure d'un arc de méridien au Spitsberg. Par Charles Rabot.

MATHEMATICAL GEOGRAPHY.

Astronomy. ———
Appendix to Nautical Almanac, 1901. Corrections to the apparent places of Nautical Almanac Stars visible at Greenwich. Deduced from the Paris Conference (1896) Constants, so as to obtain apparent places corresponding to the Struve-Peters Constants. Size 9½ × 6, pp. 22.

Cartography—Methods. **Cattolica.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. i.): 245–260.
Dei metodi seguiti dal R. Ufficio Idrografico nel disegno e nella riproduzione delle carte idrografiche. Conferenza del Comandante P. L. Cattolica. *With Charts, etc.*

Geodesy. *G. Tidskrift* **16** (1901): 18–30. **Engell.**
Om Bestemmelsen af Jordens Form og Størrelse. En historisk-geodætisk Oversigt. Af Dr. Phil. M. C. Engell.

Geodesy. *C. Rd.* **132** (1901): 597–599. **Hatt.**
Utilisation des points de Collins pour la détermination d'un quadrilatère. Note de M. Hatt.

Geodesy. *Öfversigt K. Vet. A. Förhand. Stockholm* **57** (1900): 957–975. **Oseen.**
Ueber die allgemeinste Abbildung der geodätischen Kreise einer Fläche durch Berührungstransformationen. Von C. W. Oseen.

Globes. *Atti Terzo Congresso G. Italiano, Firenze*, 1898 (vol. ii.): 501–505. **Fiorini.**
Sfere terrestri e celesti di autore italiano, oppure in Italia fatte o conservate. Comunicazione del Prof. Matteo Fiorini.

Map projections. **Maes.**
Projection Sphérique comparée aux autres projections. Par Valère Maes. (Université Nouvelle, Institut Géographique de Bruxelles, Publication No. 4.) Bruxelles, 1901. Size 10 × 6½, pp. 14. *Illustrations.*

Mariner's Compass. **Botto.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 363–381.
Contributo agli studi storici sull' origine della bussola nautica. Memoria del Colonello del Genio Antonio Botto.

Nautical Almanac. ———
The Nautical Almanac and Astronomical Ephemeris for the year 1904. Also Part i. only (containing such portions as are essential for Navigation). London: Eyre & Spottiswoode. Size 9 × 6, pp. xiv., 638, and 18; Part i., xiv. and 310. *Diagrams. Price 2s. 6d.; Part I., 1s. Presented by the Admiralty.*

Surveying—Methods. **Laussedat.**
Recherches sur les Instruments, les Méthodes et le dessin topographiques. Par le Colonel A. Laussedat. Tome ii., Première Partie. Iconométrie et Métrophotographie. Paris: Gauthier-Villars, 1901. Size 10 × 6½, pp. 198. *Maps and Plates.*

The first volume of this work appeared in 1898, and was noticed in the *Journal* for the following year (vol. xiii. p. 459). The present instalment deals with the various methods of obtaining maps and plans from pictorial views.

Use of Maps. **Sensini.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. i.): 271–315.
L'intelligenza della carte geografiche e topografiche è indispensabile per un buono insegnamento di geografia. Conferenza del Prof. Pietro Sensini. *With Maps.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Age of the Earth. *Geolog. Mag.* **8** (1901): 125–128. **Hunt.**
The Age of the Earth and the Sodium of the Sea. By Arthur R. Hunt.
The writer points to the possibility of sea-water being absorbed by the surface rocks of the globe as affecting the calculation of the age of the Earth recently made by Prof. Joly.

Auroras. *Öfversigt K. Vet. A. Förhand. Stockholm* **57** (1900): 545–580. **Arrhenius.**
Ueber die Ursache der Nordlichter. Af Svante Arrhenius.

Auroras. **Baschin.**
Otto Baschin. Die ersten Nordlichtphotographien aufgenommen in Bossekop (Lappland). (Sonder-Abdruck aus der Meteorologischen Zeitschrift, Wien, 1900, Band 17.) Size 11½ × 7, pp. [2]. *Plate.*

Caspian Sea. *Öfversigt K. Vet. A. Förhand. Stockholm* **57** (1900): 13–29. **Lönnberg.**
Contributions to the Biology of the Caspian Sea. By Dr. Einar Lönnberg.
Contains data as to the depth and temperature of the water at different stations.

Climate. *Meteorolog. Z.* **18** (1901): 106–120. **Köppen.**
Versuch einer Klassifikation der Klimate, vorzugsweise nach ihren Beziehungen zur Pflanzenwelt. Von Dr. W. Köppen.
This is an abridged version of the article in the *Geographische Zeitschrift* for 1900, already noticed in the *Journal* (vol. xvii. p. 436).

Climate and Agriculture. *Monthly Weather Rev.* **29** (1901): 8–14. **Wren.**
Climate and Corn. By H. B. Wren.

Forest and Soil. *Petermanns M.* **47** (1901): 64–68. **Gravelius.**
Der Einfluss des Waldes auf Bodenfeuchtigkeit und Grundwasser. Von Prof. Dr. H. Gravelius.

Geological History. *Riv. G. Italiana* **8** (1901): 3–17, 81–88. **Bertelli.**
Studi intorno ad alcune ipotesi e teorie geogeniche. Del P. Timoteo Bertelli.

Geomorphology—Red Sea. **Issel.**
Atti Terzo Congresso G. Italiano, Firenzo, 1898 (vol. ii.): 73–89.
Morfologia e genesi del Mar Rosso (saggio di paleogeografia). Memoria del Prof. Arturo Issel. *With Plate.*

Glaciers. **Richter.**
Commission Internationale des Glaciers. Les Variations Périodiques des glaciers. Cinquième rapport 1899. Rédigé par E. Richter. (Extrait des *Archives des Sciences physiques et naturelles*, t. x. 1900.) Genève, 1900. Size 9 × 6, pp. 20.

Limnology. *C. Rd.* **132** (1901): 1089–1091. **Forel.**
La variation thermique des eaux. Note de M. F. A. Forel.
On temperature observations in the Lake of Geneva.

Meteorology. *Petermanns M.* **47** (1901): 86–90. **Meinardus.**
Die Hauptergebnisse der wissenschaftlichen Ballonfahrten in Norddeutschland. Von W. Meinardus.
Review of the work of Assmann and Berson.

Meteorology. *P. American A. Arts and Sci.* **36** (1901): 307–318. **Clayton.**
The Eclipse Cyclone and the Diurnal Cyclones. Results of Meteorological Observations in the Solar Eclipse of May 28, 1900. By H. Helen Clayton. *With Diagrams.*

Meteorology. **Martonne.**
Un cas particulier de la Marche diurne de la température en haute montagne. Par E. de Martonne. (Extrait du Bulletin de la Société scientifique et médicale de l'ouest, 2e trimestre 1900.) Rennes. Size 10 × 6½, pp. 10.

Meteorology—Air-dust. *C. Rd.* **132** (1901): 1153–1155. **Bertainchand.**
Sur les poussières atmosphériques observées à Tunis le 10 mars 1901. Note de M. E. Bertainchand.

Natural Boundaries. **Viezzoli.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 163–167.
I confini naturali nella coscienza popolare e nella scienza. Comunicazione del Prof. Francesco Viezzoli.

Oceanography. *Öfversigt K. Vet. A. Förhand. Stockholm* **57** (1900): 139–144. **Cleve.**
Geographical Distribution of Atlantic Copepoda and their Physical Conditions. By P. T. Cleve.

Oceanography. **Giglioli.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 3–10.
Dell' opportunità che siano riprese in Italia le osservazioni e gli studî talassografici. Relazione del Prof. Enrico H. Giglioli.

Oceanography. *B.S.G. Marseille* **24** (1900): 392–400. **Giraud.**
Les récents progrès de l'étude des mers. Par M. Hubert Giraud.

Oceanography. **Nordenskiöld.**
Öfversigt K. Vet. Förhand. Stockholm **57** (1900): 1115–1127.
Beiträge zur Kenntniss des Thierlebens in Wassersammlungen von wechselndem Salzgehalt. Von Erland Nordenskiöld. *With Illustration.*

Oceanography. *Rev. Maritime* **148** (1901): 685–703. **Thoulet.**
Conférence internationale de Stockholm pour l'étude de la mer. Par J. Thoulet. *With Maps.*

Oceanography. **Wagner.**
Zur Frage der Nomenklatur der Meeresraüme und der Geographischen Nomenklatur ueberhaupt. Vortag gehalten auf dem VII. Internationalen Geographen-Kongress in Berlin im Jahr 1899. Von Prof. Dr. Hermann Wagner. (Sonderabdruck aus den Verhandlungen des VII. Internationalen Geographen-Kongresses in Berlin, 1899.) Berlin, 1900. Size 10 × 7, pp. 370–378. *Presented by the Author.*

Oceanography—Methods. **Knudsen.**
Beretning fra Kommissionen for videnskabelig Undersøgelse af de danske Farvande. Andet Bind. Tredie Hefte. Maaling af Havvandets Temperatur og Saltholdig hed ved Hjaelp af elektrisk Telefonbro. Af Martin Knudsen. Kjøbenhavn, 1900. Size 14 × 10½, pp. 16. *Diagrams.*

Physical Geography. **Klein.**
Jahrbuch der Astronomie und Geophysik. Enthaltend die wichtigsten Fortschritte auf den Gebieten der Astrophysik, Meteorologie und physikalischen Erdkunde . . . herausgegeben von Dr. Hermann J. Klein. XI. Jahrgang, 1900. Leipzig: E. H. Mayer, 1901. Size 9 × 6, pp. viii. and 380. *Plates.*

Terrestrial Magnetism. **Wagner.**
Peter Apians Bestimmung der magnetischen Missweisung v. J. 1532 und die Nürnberger Kompassmacher. Von Hermann Wagner. (Aus den Nachrichten der K. Gesellschaft der Wissenschaften zu Göttingen. Philologisch-historische Klasse. 1901. Heft 2.) Size 9½ × 7, pp. 12. *Presented by the Author.*

The special importance of this determination of magnetic declination lies in the fact that it is one of the few cases in the sixteenth century in which the exact year of the observation is known with some certainty.

Tides. *Nautical Mag.* **70** (1901): 183–188. **Plumstead.**
The New Theory of Tide. By E. Plumstead.

Volcanoes. *Die Natur* **50** (1901): 186–187, 193–196. **Pawloff and Chulok.**
Die Vulkane der Erde und die vulkanischen Erscheinungen im Weltall. Nach Prof. A. Pawloff von S. Tschulok.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Colonisation and Health. **Hueppe.**
Ueber die modernen Kolonisationsbestrebungen und die Anpassungsmöglichkeit der Europäer in den Tropen. Von Ferdinand Hueppe. (Sonderabdruck aus der

Berliner Klinischen Wochenschrift, 1901.) Berlin: A. Hirschwald, 1901. Size 9½ × 6, pp. 34. *Price* 1*s.*

The writer is not one of those who believe in the acclimatization of Europeans in the Tropics.

Commercial Geography—Cotton. **Charlier-Tabur.**
La G., B.S.G. Paris **3** (1901): 414–418.

La production du Coton dans le monde. Par M. V. Charlier-Tabur. *With Map.*

Commercial Geography.—Fishery. **Southwell.**

Notes on the Seal and Whale Fishery of 1900. By Thomas Southwell, F.Z.S. (From the *Zoologist*, March, 1901, pp. 81–90.) Size 8½ × 5½. *Presented by the Author.*

Commercial Geography—Indiarubber. **Jordan.**

Nicanor Jordán. Manual para la Extracción y Beneficio de la Goma Elastica. La Paz, 1900. Size 9 × 7, pp. iv. and 52. *Illustrations.*

Commercial Geography—Ramie. *Rev. G.* **48** (1901): 397–407. **Rivière.**

La ramie, son aire de végétation et son industrie. Par M. Ch. Rivière.

Commercial Geography—Telegraphs. ——

Submarine and Land Telegraph Systems of the World. [From the *Summary of Commerce and Finance* for January 1899.] Treasury Department, Bureau of Statistics. Size 12 × 9½, pp. 1655–1676.

Commercial Geography—Timber. *J.S. Arts* **49** (1901): 249–265. **Schlich.**

The Outlook of the World's Timber Supply. By Dr. W. Schlich.

This will be the subject of a note in the Monthly Record.

Ethnology—Bedawin. *B. Union G. Nord de la France* **21** (1900): 65–86. **Carton.**

Le Bédouin. Par le Docteur Carton.

Ethnology—Fins. *Ann. G.* **10** (1901): 140–147. **Zaborovski.**

Les Finnois. Par M. Zaborowski.

Ethnology—Turks. *B.A. Imp. Sci. St. Pétersbourg* **13** (1900): 221–261. **Hirth.**

Sinologische Beiträge zur Geschichte der Türk-Völker. I. Die Ahnentafel Attila's nach Johannes von Thurócz. Von Friedrich Hirth.

Historical. **Callahan.**

American Relations in the Pacific and the Far East, 1784–1900. By James Morton Callahan, PH.D. (Johns Hopkins University Studies in Historical and Political Science. Series xix. Nos. 1–3.) Baltimore, 1901. Size 9½ × 6, pp. 178.

Historical. *Atti Terzo Congresso G. Italiano, Firenze*, 1898 (vol. i.): 125–149. **Marinelli.**

Discorso di chiusura del Terzo Congresso Geografico Italiano e di inaugurazione delle onoranze centenarie a Paolo Toscanelli e ad Amerigo Vespucci.

Historical. *Atti Terzo Congresso G. Italiano, Firenze*, 1898 (vol. ii.): 491–500. **Rossini.**

Vasco da Gama, Pedralvarez Cabral e Giovanni da Nova nella cronica di Kilwah. Memoria del Dott. Carlo Conti Rossini.

Historical—Azores. **Dalbertis.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 423–438.

Priorità dei Genovesi nella scoperta delle Azorre. Memoria del Capitano E. A. Dalbertis.

Historical—Map. **Casanova**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 560–569.

Sopra uno schizzo cartografico originale della prima metà del XVI. secolo. Comunicazione del Dott. Eugenio Casanova. *With Plate.*

Historical—Map. **Magnaghi.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 506–543.

Il Mappamondo del genovese Angellinus de Dalorto (1325). (Contributo alla storia della Cartografia Mediovale.) Memoria del Prof. Alberto Magnaghi.

Prof. Magnaghi's preliminary account of this map was the subject of a note in the *Journal* in 1899 (vol. xiii. p. 203).

Historical—Map. **Rodolico.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 544–550.

Di una carta nautica di Giacomo Bertran maiorchino.—Comunicazione del Dott. Niccolò Rodolico.

Historical—Map and Globe. **Marzi.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 551–559.
Notizie intorno ad un mappamondo e ad un globo terrestre posseduto nel 1509 da Luigi Guicciardini. Memoria del Dott. Demetrio Marzi.

Historical—Münster. **Beazley.**
Sebastian Münster. By C. Raymond Beazley. (From the *Geographical Journal* for April, 1901.) Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 4.

Historical—Roggewein. *Nautical Mag.* **70** (1901): 164–173. **Gillie.**
Roggewein's Voyage for Discovery of Southern Lands. By J. Gillie.

Historical—Vespucci. **Uzielli.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 455–490.
Amerigo Vespucci davanti alla critica storica. Memoria del Prof. Gustavo Uzielli.

Migrations. *Földrajzi Közlemények* **27** (1899): 266–273. **Bartek.**
A népvándorlások inditóokai és czéljai, Bartek Lajostól.

On the causes and objects of tribal migrations.

Political Geography. *B.S.R.G. d'Anvers* **25** (1901): 45–82. **Alexis.**
Bilan géographique du XIX^e siècle. Par le frère Alexis M.-G.

A *résumé* of the political changes during the nineteenth century.

Prince Henry the Navigator. **Leclercq.**
Henri le Navigateur et l'Académie Portugaise de Sagres. Par le Dr. Jules Mees. Rapport de M. Jules Leclerq. (Extrait des Bulletins Acad. Royale de Belgique, No. 1, Janvier, 1901.) Size 9×6, pp. 6. *Presented by the Author.*

In the memoir here discussed, Dr. Mees endeavoured to prove that the association of experts in cosmography which Prince Henri is said to have gathered round him at Sagres, existed only in the imagination of historians.

BIOGRAPHY.

Bell. **Hallock.**
One of Canada's Explorers. By Charles Hallock. Washington: 1901. Size $8 \times 5\frac{1}{2}$, pp. 16. *Portrait. Presented by the Author.*

Dawson. *Science* **13** (1901): 561–563. **Adams.**
George M. Dawson. By Prof. Frank D. Adams. *With Portrait.*

GENERAL.

British Colonies—Education. ———
Special Reports on Educational Subjects. Vol. 4, Educational Systems of the Chief Colonies of the British Empire (Dominion of Canada, Newfoundland, West Indies) (pp. xxxii. and 834); vol. 5 (Cape Colony, Natal, Commonwealth of Australia, New Zealand, Ceylon, Malta), pp. xxvi. and 838. London: Eyre & Spottiswoode, 1901. Size $9\frac{1}{2} \times 6$. *Price*, vol. 4, 4*s*. 8*d*.; vol. 5, 4*s*.

Congress. ———
Atti del Terzo Congresso Geografico Italiano tenuto in Firenze dal 12 al 17 Aprile, 1898, 2 vols. Firenze, 1899. Size 10×7, pp. (vol. i.) 320; (vol. ii.) 672. *Maps and Plates.*

Education. *J. School G.* **5** (1901): 129–133. **Blount.**
Exercises on United States Topographical Maps. By R. E. Blount.

The writer urges the importance of making students acquainted with the data on which geographical generalizations rest, and shows the value for this purpose of good topographical maps properly used.

Education. **Costantini.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 280–288.
Come la geografia, nell' insegnamento elementare, possa assumere una funzione efficacemente didattica ed altamente educativa. Relazione di G. C. Costantini.

The writer shows the great value of geography as an educational subject.

Education. **Ghisleri.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. i.): 261–270.
Come s'insegni la geografia negli Stati Uniti d'America. Conferenza del Prof. Arcangelo Ghisleri.

Education—Maps. **Costantini.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 289–293.

Le carte geografiche nelle scuole elementari: quali dovrebbero usari nei primi anni, quali negli anni successivi. Relazione di G. C. Costantini.

Education.—Methods. *G.Z.* 7 (1901): 195–206. **Sieger.**

Geographische und statistische methode im wirtschaftsgeographischen Unterricht. Von Prof. Dr. Sieger.

Education—Text Book. **Ghose.**

Easy Steps to Geography and Map-pointing. By R. N. Ghose. London and Glasgow: W. Collins, Sons, & Co., 1900. Size 7½ × 5, pp. 32. *Maps. Price* 4*d. Presented by the Author.*

This is merely a compilation on the old and discredited system, consisting mainly of lists of names.

Geographical Progress. ———

In Commemoration of the Reign of Her Late Majesty, Queen Victoria, Empress of India. (From the *Geographical Journal* for March, 1901.) Size 10 × 6½, pp. 28. *Portrait.*

Geology and Geography. **Porena.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 315–327.

Della Convenienza e opportunità di rinforzare nella Geografia lo studio sulle forme del terreno dal punto di vista esteriore della plastica, e di renderne più precisa e stabile la nomenclatura. Relazione del Prof. Filippo Porena.

Treats of the mutual relations of geology and geography.

German Colonies. ———

Jahresbericht über die Entwickelung der Deutschen Schutzgebiete im Jahre 1899–1900. Berlin: E. S. Mittler und Sohn, 1901. Size 12 × 9, pp. 266.

German Colonies. ———

Weissbuch. Einundzwanzigster Theil. Berlin, 1901. Size 12½ × 9, pp. 266.

Gives full statistics of the trade, etc., of the German Colonies in 1899–1900.

Measures of Length. **Uzielli.**
Atti Terzo Congresso G. Italiano, Firenze, 1898 (vol. ii.): 382–400.

L'evoluzione delle misure lineari presso i vari popoli in tutti i tempi e specialmente nel medio evo in Firenze. Comunicazione del Prof. Gustavo Uzielli.

Science of Geography. *B.S.G. Lille* 35 (1901): 269–290. **Ardaillon.**

Les principes de la Géographie moderne. Par M. Ardaillon.

The writer traces the evolution of modern geographical science from the lists of names, formerly learnt by heart, through the descriptive geography of Reclus, to the present conception of the science as the study of man and his environment.

Transliteration. **Morris.**

Literation and Transliteration. Suggestions and Notes by Henry Morris. (Bible House Papers, No. v.) London: the British and Foreign Bible Society, 1901. Size 8½ × 5½, pp. 30. *Price* 6*d.*

Although devised for purposes of general transliteration, the alphabet here suggested might to some extent supply useful hints for geographical orthography. The basis is in harmony with the R.G.S. system, but some desirable distinctions, as between *a* in *hat* and the same letter in *amount*, are introduced.

Tropical Hygiene. *Church Missionary Intelligencer* 52 (1901): 370–374. **Lankester.**

Life and Work in the Tropics, and how to prepare for it. By Herbert Lankester, M.D.

NEW MAPS.

By E. A. REEVES, ***Map Curator*****, R.G.S.**

EUROPE.

England and Wales. **Ordnance Survey.**

Ordnance Survey of England and Wales:—Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from June 1 to 30, 1901.

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Miscellaneous Map.

Roman Camp, Parish of Gelligaer, county of Glamorgan (Scale 1 : 500). 2*s.* 6*d.* (*E. Stanford, London Agent.*)

England and Wales. **Bartholome**

Reduced Ordnance Survey of England and Wales. Scale 1 : 126,720 or 2 stat. miles to an inch. Sheet: 27, Swansea. J. Bartholomew & Co., Edinburgh, 1901. *Price* 2*s. Presented by the Publishers.*

Europe. **Henk**

Verbreitung der Schriftarten in Europa um 1900. Von Dr. L. Henkel. Scale 1 : 25,000,000 or 393 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1901, Tafel 6. Gotha: Justus Perthes, 1901. *Presented by the Publisher.*

Glasgow. **Johnsto**

International Exhibition Plan of Glasgow, showing principal public buildings, railway stations, tramways, and routes to and from the exhibition. Scale 850 feet to an inch. W. & A. K. Johnston, London, and Edinburgh and Glasgow. *Price* 6*d. Presented by the Publishers.*

There are, on this one sheet, a plan of Glasgow showing the site of the exhibiti in red, and indicating the principal buildings, and streets, railways, and tramways

plan of exhibition buildings on an enlarged scale, and copious notes. It is certainly cheap for sixpence, and ought to prove very useful to those who are visiting Glasgow for the exhibition, or for the forthcoming meeting of the British Association.

Grecian Archipelago. **Philippson.**

Geologische Karte der Magnesischen Inseln und der Insel Skyros. Die Magnesischen Inseln und die Insel Skyros. Scale 1 : 300,000 or 4·8 stat. miles to an inch. Von Prof. Dr. A. Philippson. *Petermanns Geographische Mitteilungen*, Ergänzungsheft No. 134, Taf. 1 and 3. Gotha: Justus Perthes, 1901. *Presented by the Publishers.*

Grecian Archipelago. **Philippson.**

Karte der Kykladen. Geologische Karte der Kykladen. Scale 1 : 300,000 or 4·8 stat. miles to an inch. Von Prof. Dr. A. Philippson. *Petermanns Geographische Mitteilungen*, Ergänzungsheft, No. 134, Taf. 2 and 4. Gotha: Justus Perthes, 1901. *Presented by the Publisher.*

Iceland. **Thoroddsen.**

Island. Scale 1 : 3,000,000 or 47·7 stat. miles to an inch. Das Gebiet der stärksten Erdbeben-Stösse im Jahre 1896. Von Th. Thoroddsen. Scale 1 : 750,000 or 11·9 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1901, Tafel 5. Gotha: Justus Perthes, 1901. *Presented by the Publisher.*

ASIA.

Armenia. **Lynch and Oswald.**

Map of Armenia and Adjacent Countries. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. By H. F. B. Lynch, M.A., and F. Oswald, B.SC. The material compiled by W. Shawe, F.R.G.S. London: E. Stanford, 1901. *Price* 10*s.* 6*d.* *Presented by the Publisher.*

The area included in this map is, approximately, from lat. 37° 10′ N. to 42° 10′ N., and from long. 32° 20′ E. to 49° 50′ E. It thus embraces portions of three countries—Russia, Turkey, and Persia—with Mount Ararat in the centre of the sheet. The material from which the map is compiled varies considerably in value and in the degree of dependence which can be placed upon it. For the Russian territory there is primarily the 5-verst government survey, which, however faulty it may be in mountainous regions, is tolerably accurate in most of the lower-lying district; but for those parts belonging to Turkey and Persia, with the exception of a few small districts that have now been fairly well mapped, nothing exist but a more or less disconnected series of route surveys, some of which are extremely rough. For the Turco-Persian frontier there are the surveys made by the Russian and English officers in 1849–1855. Quite recently a good deal of survey work has been done by English officers and others who have held official appointments in various parts of Armenia, of which perhaps that of Major F. R. Maunsell, R.A., is the latest and most reliable. All this has, as far as possible, been utilized by the authors, and Major Maunsell's work has been of special service to them, and enabled them greatly to improve their map, particularly in the neighbourhood of Lake Van.

Mr. Lynch, assisted by Mr. F. Oswald, who accompanied him on his second journey in 1898, has, with painstaking care, made use of all the most trustworthy available material furnished by others. But he has done more than this, for he has also himself travelled extensively in the country, and made route surveys and copious notes. He has also taken a great number of boiling-point and barometric observations for height, which have been carefully computed and laid down upon the map, the compilation of which has been undertaken by Mr. W. Shawe under his personal supervision; and taken as a whole the map is certainly a very creditable production, although it is to be regretted that the hillwork is so dark that in the mountainous regions it is very difficult to read many of the names.

Mr. Lynch's routes are shown in red, and a full description of these will be found in his recently published work on Armenia, which the map accompanies. Separate copies of the map can, however, be obtained at Stanford's, where it has been lithographed.

China. **Ferguson.**

Map of the Waterways near Shanghai. Scale 1 : 63,360 or 1 stat. mile to an inch. Thomas Ferguson. Shanghai: Kelly & Walsh, Ltd., 1901. 2 sheets. *Presented by the Author.*

The coast-line and the course of the lower Whangpu river have been taken from the Admiralty charts; but the remaining portions of this map are from an original

survey made by Mr. Ferguson with the aid of an instrument which he has invented, called the "hodograph." This instrument, which appears to be somewhat on the principle of a ship's patent log, and suitable for boat work, records automatically the direction and distance followed, thus, it is stated, rendering it possible to make a very rapid and tolerably accurate survey of the waterways of a country. This map includes the rivers and creeks for about 13 to 20 miles round Shanghai. As a check upon the work, most of them were passed over twice, in opposite directions, and the mean direction and distance taken and laid down. The map is in two sheets, on one of which is a list of astronomical positions, and an explanation of the symbols employed.

Indian Government Surveys. **Surveyor-General of India.**

Indian Atlas, 4 miles to an inch. Sheets: 9 S.W., parts of district Hyderabad and Native State of Khairpur (Sind, Bombay Presidency), additions to 1897; 31 N.E., parts of districts Ferozepore and Indhiána, and of Patiála, Nábha, Faridkot, and Jind (Native States), Punjab, additions to 1898; 39 N.W., parts of districts Ahmednagar Poona Thána and Sátára, and of Native State Bhor (Bombay Presidency), additions to 1899; 51 N.E., parts of Native States Gwalior (C.I. Agency), Karauli, and Dholpur (Rajputana Agency), additions to 1900; 69 N.W., parts of Gwalior and Bundelkhand (C.I. Agency), and of districts Jalaun, Jhánsi, Hamirpur, and Etáwah (N.W. Provinces), additions and corrections to 1900.—Burma-China Boundary Commission, 1 inch to a mile. Seasons 1898–1900. 13 sheets.—Bengal Survey, 1 inch to a mile. Sheet 69, district Puri, Seasons 1889–90 and 1894–95. 1900.—Bombay Survey, 1 inch to a mile. Sheet 201, districts Colába, Ratnágiri, and Sátára, Seasons 1877–78 and 1879–80. 1900.—Upper Burma Survey, 1 inch to a mile. Sheets: 174, district Minbu, Season 1892–93. 1900. 260, parts of districts Mandalay, Sagaing, and Shwebo, Seasons 1890–93 and 1896–97. 1900. 312, Southern Shan States and district Meiktila, Seasons 1893–94 and 1898–99. 1900.—Central India and Rajputana Survey, 1 inch to a mile. Sheets: 210, parts of Rutlam, Sailana (C.I. Agency), and of Banswara, Kusalgarh, and Khandu (Rajputana Agency), Season 1881–82. 1899. 322, parts of Gwalior (C.I. Agency) and Kotah (Rajputana Agency), Seasons 1865–67. 1900. 364, parts of Gwalior (C.I. Agency) and of Dholpur (Rajputana Agency), Seasons 1863–65. 1900.—South-Eastern Frontier, 1 inch to 4 miles. Sheet 1 N.E., parts of districts Upper Chindwin, Katha, and Shwebo, and of Chin hills (Upper Burma), and of Manipur Native State (Assam), Seasons 1886–94 and 1897–98. 1900.—Sind Survey, 1 inch to a mile. Sheet 70, district Hyderabad, Season 1898–99. 1900.—Eastern Bengal. Sheet 12, districts Rangpur and Dinajpur, and parts of districts Jalpaiguri with Cooch-Behar, Bogra, Malda, Purnea, Rájsháhi, and Mymensingh (Bengal), Gāro Hills, and parts of districts Goálpára and Sylhet (Assam).—India to illustrate Gauges of Railways, 80 miles to an inch. 1900.—District Bhaugulpur, Lower Provinces Revenue Survey, 1 inch to a mile. 1900. 5 sheets.—District Lackhimpur, Assam, 12 miles to an inch. 1900.—District Cachar, Assam, 8 miles to an inch. 1900.—Map of the Central Provinces, 32 miles to an inch. With additions to 1900.—Central India Agency, 80 miles to an inch. 1900.—Gujarát, 16 miles to an inch. 1900.—Chart of Triangulation and Traversing Gujarát Survey, 4 miles to an inch. Degree sheet xiv., Seasons 1878–79, 1883–87, and 1890–91. 1900.—Nos. 1 and 2, Preliminary Charts of the Principal Triangulation of the Mákran Longitudinal Series, 4 miles to an inch. Seasons 1895–97. 1900. *Presented by H.M. Secretary of State for India, through the India Office.*

Russia in Asia. **Stahl.**

Deltagebiet der Flüsse Ural, Sagis und Emba. Gezeichnet von A. F. Stahl, 1899. Scale 1 : 1,200,000 or 19·0 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1901, Tafel 9. Gotha: Justus Perthes, 1901. *Presented by the Publisher.*

AFRICA.

Angola. **Commissão de Cartographia, Lisbon.**

Carta de Angola. Scale 1 : 3,000,000 or 47·4 stat. miles to an inch. Commissão de Cartographia, Lisbon, 1900. 2nd edition. *Presented by the Commissão de Cartographia.*

With the exception of some modifications of the boundaries, and a few alterations in the courses of rivers, this, the second edition of the Portuguese government map of Angola, remains very much the same as the first, which appeared in 1892. Since last year, when this edition was published, a considerable amount of fresh information has come to hand, especially with reference to the upper waters of the Zambezi and its tributaries, so that already it is far from complete in many respects.

Madagascar. **Service Géographique du Corps d'Occupation.**

Carte de Madagascar. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. Service Géographique du Corps d'Occupation. 6 sheets.

This map, which has been published by the French Service Géographique du Corps d'Occupation, contains a good deal of information. It is, however, not a very satisfactory production, and by far the greater number of the names are so small as to be almost illegible without a glass. It is printed in colours—hill work brown, water blue, and forests green.

AMERICA.

Amazon. **Katzer.**

Karte der Mündung des Trombetas in den Amazonas. Hauptsächlich nach den Aufnahmen der Ingenieure: Le Blanc, Robert, Haag, Paul le Cointe, Valente do Couto und nach eigenen Beobachtungen zusammengestellt von Dr. Friedrich Katzer. Scale 1 : 700,000 or 11·5 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1901, Tafel 4. Gotha: Justus Perthes, 1901. *Presented by the Publisher.*

Central America. **Sapper.**

Die Verbreitung der Sprachen im Südlichen Mittelamerika ums Jahr 1899. Von Dr. Carl Sapper. Scale 1 : 4,000,000 or 63·2 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1901, Tafel 3. Gotha: Justus Perthes, 1901. *Presented by the Publisher.*

Haiti. **Tippenhauer.**

Geologische Karte der Eruptiv-zone von Terre-Neuve (Insel Haiti). Nach eigenen Aufnahmen vom 17 Nov. bis 4 Dez. 1900 und vom 9 Jan. bis 9 Feb. 1901, gezeichnet von L. Gentil Tippenhauer, Ingenieur. Scale 1 : 75,000, or 1·2 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1901, Tafel 10. Gotha: Justus Perthes, 1901. *Presented by the Publisher.*

ATLANTIC OCEAN.

North Sea. **Hjort.**

Ergebnisse der ersten norwegischen "Michael Sars" Expedition, im Sommer 1900. Von Johan Hjort. Scale 1 : 37,000,000 or 584 stat. miles to an inch. Hydrographische Profile durch das Nordmeer. Petermanns Geographische Mitteilungen Jahrgang 1901, Taf. 7 and 8. Gotha: Justus Perthes. *Presented by the Publisher.*

CHARTS.

North Atlantic Ocean and Mediterranean Sea. **Meteorological Office, London.**

Monthly Pilot Chart of the North Atlantic Ocean and Mediterranean Sea for July, 1901. Meteorological Office, London. *Price 6d. Presented by the Meteorological Office.*

Portuguese Charts. **Commissão de Cartographia, Lisbon.**

Reconhecimento do Porto Interior da Beira, Moçambique, 1 : 30,000. 1899.—Reconhecimento hydrographico da Barra do Rio Tejungo, Moçambique, 1 : 25,000. 1898.—Plano hydrographico da Bahia do Lobito, Angola, 1 : 10,000. 1891.—Plano hydrographico de Landana ao Massabi, 1 : 40,000. 1891.—Archipelago de Cabo Verde, 1 : 500,000. 1900.—Ilha de S^{to}. Antão, Plano hydrographico do Porto da Ponta do Sol, Archipelago de Cabo Verde, 1 : 10,000. 1900.—Plano hydrographico do Porto Grande de S. Vicente, Archipelago de Cabo Verde, 1 : 20,000. 1900.—Reconhecimento hydrographico da Barra de Betul e Foz do Rio de Sal, Goa, 1 : 2,500. 1899.—Carta de Ventos e Correntes do Oceano Atlantico, Janeiro, Fevereiro, Marco. 1900. Ministerio da Marinha e Ultramar, Commissão de Cartographia, Lisbon. *Presented by the Commissão de Cartographia.*

U.S. Charts. **U.S. Hydrographic Office.**

Pilot Chart of the North Pacific Ocean for July 1901, and North Atlantic Ocean for June 1901. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Andes. **Argentine Boundary Commission.**

Panorama of the Cordillera de los Andes from the Contrabandista Pass. *Presented by the Argentine Boundary Commission.*

This excellent panorama consists of enlargements from nine negatives taken by the


R. Panynim
Chacuriquiha
L. Mauo
R. Seuynim
L. Maripu
Cachapa
L. Sapica

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EXPLORATIONS IN THE GREAT BEAR LAKE REGION.*

By J. MACKINTOSH BELL, M.A.

Throughout the Dominion of Canada still lie immense tracts of country where the white man has never been, and where the few wandering savages who there make their home are still as wild and uncivilized as in the days of Columbus. The day is not far distant when much of this great region will support a thriving population, but the arctic part of it must remain, from climatological reasons, as it is now, a great northern wilderness, a home fit only for savages, and a refuge for caribou, musk-oxen, and other northern animals.

My recent explorations in the Mackenzie river region of Northern Canada, undertaken in pursuance of instructions received from Dr. Robert Bell of the Geological Survey of Canada, extend northwards from the 60th parallel N. lat. to the Arctic ocean. In this paper I would like to deal more particularly with the country around Great Bear lake to Coronation gulf and the Coppermine river, and southwards towards Great Slave lake. I was preceded in this region by the explorations of Sir John Franklin and Sir John Richardson during the early part of the last century, and towards the middle of the century by the latter, with Messrs. Dease and Simpson, and I had, naturally, some diffidence in doing work in a country which had previously been visited by such able men. However, the eastern part of Great Bear lake was before our visit unknown, and in our journey southward from Great Bear lake to Great Slave lake we passed through a thoroughly unexplored country, rarely visited even by the natives, and known only by the writings of that wonderful traveller, the Abbé Pétitot.

We started from Fort Resolution, a Hudson's Bay Company's post on Great Slave, on April 11, and crossed to the outlet of the Mackenzie

* Read at the Royal Geographical Society, May 13, 1901. For discussion see p. 43. Map, p. 352.

river. Here we were obliged to wait till the ice broke up on May 12, and soon after started down-stream by canoe. Below Fort Simpson the Mackenzie, after its junction with the Liard, becomes a magnificent stream, being for the most part over a mile in width, and with a current of from 3 to 6 miles an hour. Its beautiful spruce-clad shores are hemmed in by the eastern Rocky mountains, which rise majestically, a veritable "Mer des Montagnes," on either side. We started from Fort Norman, in lat. 64° 55′ N., on June 16, leaving behind the last trace of even a semi-barbarous civilization. Soon after our departure from the last-named place we commenced the ascent of the Bear

OLD SHORES OF GREAT BEAR LAKE, CAPE MACDONNELL.

river, a stream somewhat swifter than the Mackenzie. At the time of our visit, travelling was particularly difficult. The ice of the Bear river had broken up only a few weeks before, and was piled all along the bank, 10, 20, and in places even 30 feet above the water, so that my men, in hauling our canoes by means of tracking lines, were obliged to walk on the top of this high border of ice. The Bear river is a fine, clear-watered stream, 350 yards in width at its mouth, and about 250 yards at its outlet from Great Bear lake. Leaving the Mackenzie, the river flows through a deep wooded valley, whose steep slopes show exposures of unaltered, horizontally bedded Tertiary strata. Some 40 miles up we entered that spur of the Rocky mountains which had crossed the Mackenzie below Fort Simpson,

and here for 2 or 3 miles the river runs through a deep cañon, having cut its way down in places 300 feet. Just below the rapid of the cañon the mountains rise in a series of peaks of anticlinal structure, called by Sir John Franklin, the *Mountains* at the *Rapid*. The highest of these peaks, Mount Charles, does not exceed 1500 feet in height, but its rough, jagged outline, its steep slopes of talus blocks, and its sombre colouring greatly increase its apparent height. The Rocky mountains are here composed of altered limestones, dolomites, breccias, and quartzites, all much contorted. A few fragmentary fossils were found, which show the rocks to be of Ordivician age. The walls of the cañon are

OLD SHORE LINES (TERRACES), NORTH SHORE, MACTAVISH BAY, GREAT BEAR LAKE.

formed of almost unaltered and nearly horizontal Cretaceous sandstones, shales, and marls, and through these soft strata the Bear river has easily worn itself a deep bed. This erosion is going on rapidly at present, the swift current of the Bear river being materially aided by the intense cold of the subarctic winter. In the 40 miles intervening between the cañon and Great Bear lake, the river meanders through a deep wooded valley, with terraces showing the former levels of the stream, which may have been of greater breadth in comparatively recent times. Gravel beds of great thicknesses, sometimes associated with Archæan boulders and sand, are exposed along the river-bank. How these great masses of gravel could have been formed is more or less a matter of conjecture, as they are overlaid by boulder-clays of the later

glacial period. If of pleistocene origin, they must have been laid down quite early in that epoch. On the other hand, they have been deposited since Cretaceous times, as they overlie Cretaceous strata. It is probable that the deposition of gravel continued uninterruptedly from Tertiary into Pleistocene times.

Reaching Great Bear lake on June 23, we were disappointed to find that the ice of the lake was still as continuous as in mid-winter. This was anything but an encouraging outlook to greet our arrival, and it was made the worse by the news which the Indians brought in a few days afterwards. They told us that they had crossed from the north-east end of the lake by dog-team, and that we need not expect the ice to break up for at least three weeks' time. These Indians, belonging to the Hareskin tribe, came under the leadership of their chief, Itzekah, a native of the most objectionable type. He wanted to know whence I had come, what was my reason for being there, and if the great white mother had sent anything for them. He told me that he wished me to understand that we were to kill no caribou in his country, because, if the white man killed one of these animals, all the rest would disappear. Finally, however, by giving him presents of black tobacco, and by amusing him and his band in various ways, they became quite cordial, told us where we would get the best fish, where the most of the caribou were, and, as a last concession, the chief agreed to have some of his band waiting for us on August 15 at the south-east extremity of the lake to guide us across country to Great Slave lake. The Hareskin Indians are, for the most part, a harmless, good-natured race, living on the fish they catch or the deer they kill. As a rule, at least once a year they travel to the Hudson's Bay Company's post at Fort Norman, to trade their dried meat and furs. They are as yet little civilized, though the majority have recently been Christianized by the Oblate Fathers. They are rather a handsome race, being tall and well built, and their picturesque deerskin coats and leggings, ornamented with beads and porcupine quills, give them a pleasing appearance.

Fortunately, the Indian forecast as to the break-up of the ice was a little overdrawn. The lake was sufficiently clear to enable us to start around the north shore on July 4, although it was the 12th before we reached Richardson bay, having had numerous delays, occasioned by the ice packing up against the shore. Leaving Richardson bay, we decided to follow an old Indian portage-route by small lakes, across the Sweet Grass Hills peninsula, rather than attempt to go round the shore past Gros Cap, where the ice was still packed tight. Here I hoped also to learn something both of the geology and geography of the interior. Reaching Icebound bay, we were again delayed by the ice, and it was not till the 25th, and then only by breaking our way through the ice for 4 miles, that we were able to make the traverse across Smith bay to the north shore.

WIND-COVERED TREES, EAST SHORE, RUSSELL BAY, GREAT BEAR LAKE.

We reached old Fort Confidence, at the extreme north-east of the lake, on July 30. Here it was that Sir John Richardson and Dr. Rae wintered during their search after traces of Sir John Franklin. We were surprised to find the log houses of the fort still in good condition, though almost half a century had elapsed since their occupation, more especially as not even the chimneys were standing of Franklin's post at the outlet of the Bear river. Not a single nail had been used in the buildings of Fort Confidence, but skilful dovetailing had given the houses both neatness and durability. The fort is situated in a sheltered place behind a big island, with rising ground to the north of it. Its location is one of the few well-wooded spots on the lake, and the trees are of fine growth, worthy of a more southern latitude. The ground had been free from snow for some weeks, and was covered with green moss, interspersed with many-coloured flowers, which mature quickly during the season of perpetual sunshine. The park-like appearance of this far northern spot was indeed refreshing after the dreary shore we had passed along since leaving the outlet of the lake. The northern and north-western shores of Great Bear lake present no very interesting geological features. To within 30 miles of Fort Confidence the lake is surrounded by unaltered Cretaceous strata, with few exposures of solid rock. Hard sandstone, interstratified with loose shale, is exposed in a long anticlinal fold, the backbone of the Sweet Grass hills. On Icebound bay I noticed excrescences of sulphur and alum. From a point about 30 miles west

of Fort Confidence, as far east as the Coppermine river, the rocks exposed are similar to those of the copper region of Lake Superior, and are probably referable to the Nipigon or Keewanawn of the Lower Cambrian system. They consist of dolomites, quartzites, shales, grits, and conglomerates, dipping at all angles. These strata are much folded and contorted, and they are cut by numerous greenstone dykes.

From Fort Confidence, ten days were occupied in making a traverse across country to the Coppermine river. On the fifth day out, we reached this stream at a point about 15 miles from its mouth. It is here a fine large river, about half a mile in width. We were pleased to see, after the Barren Lands we had passed over since leaving Great Bear lake, that a few spruce trees grew in the river's sheltered valley, though none of them was of large size. The country in this vicinity is particularly dreary and desolate; geologically, however, it is of great interest. The Copper mountains, which follow the Coppermine for some distance, have a maximum height of about 1600 feet. The lowest exposures are of stratified sandstones and grits, with amygduloid above, cut in several places by immense intrusive sheets of greenstone. They often form perpendicular walls relieved at the foot with talus slopes. Evidences of glaciation are striking. The hard rocks have been scored and grooved by the ice. Glacial mounds or drumlins, some of which are 200 feet in height, with long winding lateral moraines, show the path of the glacier.

OLD FORT CONFIDENCE, NORTH-EAST END OF GREAT BEAR LAKE.

TUNDRA COUNTRY, SOUTH OF CORONATION GULF.

Returning from the Coppermine, we fell in with a party of Eskimo, who ran from us as we approached, in spite of all our efforts to restrain them. But, as a matter of fact, even had we been bloodthirstily inclined, we would have put up a poor fight, because both my assistant and I were quite tired out, and my men had gone on some hours before us. It seems rather incredible that twenty-five Eskimo would run from two played-out white men; but it is quite probable that they may have expected an army behind us. Their camp was a most extraordinary place. It lay on a hillock of sand, with a large lake in front and a pond behind. The knoll was capped with three or four small huts, the walls of which were formed of flat stones placed on end, and the roofs of caribou-skin. The pond was filled with caribou-bones, which showed that the camp had been much frequented. In the middle of the miniature village lay a large heap of raw caribou meat, which the Eskimo store up in seasons of plenty. We waited some time at the camp, hoping the natives would reappear, but they did not. It was their period of good feeding. The caribou were grazing on the Barren Lands in vast herds, and musk-oxen were plentiful, so there was no necessity for them to return to their extra food-supply. They had evidently never come in contact with white men before, because no article of civilized manufacture was found in their camp. We left what we could for them, and continued our way southward against a snow-storm which had set in over the

Barren Lands. Next day we crossed the Dease river, the boundary of the Eskimo country. A few days later we had occasion to return towards the Coppermine, and at the crossing of the Dease, on the Eskimo side, three caribou-bones stood, sharpened and pointed in our direction. Some of these people had followed us secretly all the way from their camp. They had watched us as we slept in the rocks, and had only turned back when they reached the Hareskin boundary. What the strange sign of the three bones could have meant, I know not. It may have warned us to never again enter the Eskimo country, or else it may have been a sign of friendship to us from one of the aboriginal bands still left on the American continent who have as yet had no dealings with the white man.

We left Fort Confidence going southward along the eastern shore of Great Bear lake on August 13, and coasted the southern side of Dease bay. For about 20 miles the country is interesting, being rocky and thinly wooded, but beyond that, as far as Cape MacDonnell and eastward from it along the northern shore of MacTavish bay, the shore-line is particularly monotonous—a low treeless waste, broken only by hills of gravel and huge glacial erratics. One feature here is, however, of great geological interest. On the northern shore of Dease bay I had noticed terraces of sand and gravel, showing former shore-lines of the lake, extending back from the present lake-edge to a distance of a mile and a half, the greatest height being about 300 feet. Along the northern shore of MacTavish bay I found these same terraces of gravel extending into the interior at heights of 10 to 20 feet, and more. The height of these terraces is much greater than those met with in the south-east and south-west, and may show a gradual tilting of the lake-basin toward the south. The eastern shore of MacTavish bay is rugged and mountainous. The cliffs often rise 1000 feet almost perpendicularly from the water's edge. The rocks are a series of basic eruptives, similar to certain greenstones which extend some distance south of Great Bear lake, where they are replaced by granites and gneisses, the typical Laurentian of North America. All these rocks weather to beautiful shades of purple, red, and brown, and the reflections of the coloured precipitous cliffs in the clear northern waters, with the brilliant arctic sunlight, were singularly beautiful. Difficulty was occasionally met with in finding a landing-place, but as a rule sheltered harbours were found in which the scenery would delight the eye of any connoisseur of the beautiful.

Reaching the appointed place on the southern shore of Great Bear lake, we were disappointed to find that the Indians, who had agreed to meet us there and guide us south to Great Slave lake, had already left for their hunting-grounds. We could not grumble at this, however, as it was quite two weeks later than the time we had agreed to arrive, having been delayed longer than we had expected. They had probably given

us up as lost, a fate which they think will overcome all white men who travel in their inhospitable country. We were thus obliged to start across country without a guide, a course which I did not at the time like to undertake, as we knew nothing of the district, and had only a scanty supply of provisions. We ascended the Camsell river, a fine rapid stream much broken by waterfalls, and pushed on through its expansions, some of which are lakes of considerable size. Portages were frequently made to avoid dangerous rapids, or to shorten the distance by portaging from lake to lake rather than by following the great bends of the river.

I often climbed hills to look over the lie of the land, and thus ascertain

DRUMLINS (GLACIAL MOUNDS), BARREN LANDS, SOUTH OF CORONATION GULF.

the best places to make portages from lake to lake. Some 30 miles up the Camsell river we portaged into a large lake, known to the Indians as Lake Hottah, or Two-year-old Moose lake. It is over 40 miles in length by fully 10 miles in width. Its surface is a maze of islands, which made the surveying of it particularly difficult. The scenery here was very fine. High blue hills rose to the westward, the numerous islands were well wooded, and reminded one of the Thousand islands of the St. Lawrence river, and the water was of a limpid clearness. Leaving Lake Hottah, a short portage brought us into Lake Stairs, an expansion of the Camsell river, which we followed from this lake as far as the height-of-land, passing through its numerous expansions. The last lake of considerable size before reaching the height of land was Lake Dawasonecha, or the Lake of the Small Rat's House. It is a magnificent sheet of

water, fully 25 miles in length by 10 in width, filled with fish of all the kinds common to Northern Canada. To the east and south of this lake a low range of hills, the Eastlake mountains, rise to a height of about 1300 feet. A view from the top of this range showed a tree-covered country dotted with lakes in all directions as far as the eye could reach.

Near Dawaso-necha lake we were fortunate enough to meet some Dogrib Indians, who agreed to guide us across the height-of-land to Great Slave lake. Crossing the low swampy ridge, we reached the waters of Summit lake, which empties by the Marian and Petitot rivers into Lake Marian, the northern expansion of the Fort Rae arm of Great Slave lake. We descended the Marian to its junction with the Petitot river, making numerous portages to avoid rapids and falls. We passed down the Petitot river to Lake Marian, whence our journey across the lake to Fort Rae, the most northerly point in this direction, was a comparatively easy one, but attended with some danger owing to the lateness of the season.

All the country south of Great Bear lake, almost as far east as the Coppermine, is fairly well wooded. The Dogrib Indians who inhabit this region are a kindly, good-natured tribe, superior to their Hareskin neighbours to the north. The numerous lakes teem with fish, which with waterfowl formed the chief food-supply of my party after leaving Great Bear lake. Moose and bear are common, while caribou at certain seasons of the year are still plentiful; but year by year these animals, which formerly inhabited the whole country east of the Mackenzie, have been pushed gradually northward, so that places which they visited as recently as six years ago, know them no more. Every year the Indians and Eskimo kill thousands of them for their tongues alone, and even for the "sport" of killing them, so that there is a probability in the near future of this beautiful and useful animal sharing the fate of the North American buffalo.

A JOURNEY FROM ZEILA TO LAKE RUDOLF.*

By JAMES J. HARRISON.

THE object of our expedition was to carry a complete survey through the Hawash valley to Lake Rudolf, and if possible across to the Nile, at the same time combining a sporting trip in which attention was to be directed to the beasts and birds of the countries visited. On November 5, 1899, we landed at Aden, our party consisting of Mr. A. E. Butter, Mr. P. G. Powell-Cotton, Mr. W. F. Whitehouse, and myself. As surveyor we had Mr. Donald Clarke, who had already had some twenty years' experience of surveying work in different parts of Africa; while Mr. R. Perks went as taxidermist. A few hours' delay to make final

* Map, p. 352.

arrangements with Messrs. Cowasjie Dinshaw found us and stores on board the *Woodcock*, another fourteen hours landing us at Zeila on November 9, 1899.

It took us five days' hard work to repack and arrange our loads, engage boys (who asked enormous wages), and collect more transport. We were lucky enough to induce Mohamed Hassan, a Somali boy, to go as our headman, he having already done much of the country with poor Captain Wellby. Besides speaking good English, Abyssinian, Galla, and innumerable other tribal languages, he proved himself to be quite the hardest-working man I ever met. We engaged a splendid lot of boys, in all about 61, chiefly those accustomed to long trips, most having been with Lord Delamere, Dr. Donaldson Smith, Captain Wellby, or Mr. Cavendish. We knew at the outset that our journey was undertaken at the worst possible time, owing to the unprecedented two years' drought which had extended over the whole of East Africa to the Nile. Our transport, to begin with, was sixty camels (twelve for water) purchased, and twenty hired to Gildessa, but the latter were afterwards replaced by bought ones, for which we sent back to Berbera, they following us loaded with rice. To Gildessa our route is fairly well known. Owing to drought we had to make some long marches, doing 164 miles in twelve days—an average of 13½ miles a day—mostly between the hours of 2 and 9 a.m.

The country varies from the hard sandy plain covered with rough short scrub to undulating hills covered with rocks and boulders. Grass, of course, was out of the question, but our camels picked a living among the mimosa trees. For our ponies we carried a little corn and fodder, but on reaching Gildessa we owned another fortnight of such country would have ruined our transport.

The game we found consisted of Semmering's gazelle, Pelzeln's gazelle, Waller's gazelle, Beira antelope (in the high Marmar mountains at Aroweina), the beautiful lesser koodoo, greater koodoo, and wart-hog. On shooting the latter, how one hated Somali boys and their Mohammedan religion! for nothing would induce them to touch the animal, so all the loading, bringing into camp, skinning, drying, and even packing every day for the march, had to be done by the white man. More than this, any sack, rope, or knife touched by the poor pig was defiled, and had to be destroyed. Smaller animals included the beautiful little dik-dik, lynx, jackal, fox, hare, with numerous guinea-fowl, bustard, eagles, and vultures. One of the latter measured 110 inches from tip to tip of wing, standing 42 inches high, while the span of the claws was 9½ inches.

Between Hensa and Lasman the country is all volcanic, and terribly hard marching for camels. Water had to be carried nearly every other march, all the streams being dry, and most of the Somali wells too. At Aroweina the wells are 28 feet deep in the river-bed, and yet there is hardly any water. On November 22 we camped in the dry bed of a

stream, Beja Kaboba, just under a conical-shaped hill with a small stone fort flying the Abyssinian flag. We very soon had a state visit from the governor and garrison, consisting of an outpost of four men. Having fired numerous salutes, we entered into conversation over a glass of brandy, and found we were expected, notice of our coming having been sent down by the Emperor Menelik. In this district we found lesser koodoo fairly plentiful. Here we unfortunately began losing our camels, no doubt owing to their eating that scourge of a plant called "gumbot," which is poisonous. Having got our caravan into fairly good working order, we began the daily task of drilling our retainers, 50 of whom were armed with government rifles from Aden. On November 26 we reached Gildessa, escorted to our camping-place by the whole population. After lunch, our worthy friend the Shum "Alto Zavike" came in state to call. Nothing could equal the kindness we received while staying here two days: presents of sheep, goats, honey, milk, eggs, bread, and firewood came in daily. To our great joy we found four good mules awaiting us, kindly sent down by Colonel Harrington, also letters saying the Emperor had given us leave to travel by a new route through the Hawash valley, and would be pleased to see us at Adis Abbeba. Being short of transport, we left eighteen loads of durra and rice to follow with hired camels when Mohamed should come with our second detachment. We could only buy six donkeys and a few sheep and goats (the latter for milk).

On November 28 we left Gildessa, accompanied by a large following, our road lying through thick scrub, while we wended our way by sheep-tracks between high ranges of hills, camping at a place called Odah. During our march we crossed two running streams, the first running water since leaving the coast. These streams join two other rivers—the Gildessa and Odah; but following them down some 20 miles, we found them disappear through running out and sinking into the earth, a rather common occurrence in Northern Africa. For some days our course lay due west along the foot of a lofty range of broken mountains, called the Kobul hills. I climbed these one day after large koodoo. The rocks were awful, evidently all due to very recent volcanic action. Our camels here looked very bad; so, resting a day, we made a big koodoo into strong soup, and gave each camel a good drink, which seemed to effect a wonderful change. Along this valley we found several nice streams running. On December 4 we camped at a series of water-holes called Ulfulu, around which were gathered hundreds of camels, goats, and sheep. Here, also, we had to sit and undergo at least an hour and a half of native war-dances, given by three neighbouring chiefs and forty of their followers clad in full war-paint. Another march brought us to the river Herrar, on the banks of which we found some lovely trees to camp under. Here our Gildessa guides and twelve hired camels left us, the country ahead

belonging to a powerful and independent chief called Tumbacha. A two hours' march brought us to his village called Korta, a short distance from which we discovered what had once formed two good lakes, but was now only a huge marsh overgrown with dense reeds. The chief, a most unprepossessing individual, paid us a long visit. He began by demanding absurd presents before letting us pass, and after hours of talking, he and his retainers all left in a by no means friendly manner. Having no thorns with which to make a zereba, we stored our baggage as a rampart, doubled all sentries, and served out ball cartridge. This chief has for years caused the emperor great trouble, fighting his people and raiding caravans; so lately he has been kept quiet by the payment of an annual sum. For this reason we were most anxious to part friends, especially as our second detachment of loaded camels was behind. We moved on for two days, when, finding some excellent grass, we determined to camp, sending back eight armed men to help our rear convoy in case of trouble. Before they arrived, Tumbacha had beaten two of our men and tied them up until they promised to give him a camel-load of rice and two bales of cloth. We were thankful to see the rest march into camp, but it was hard to prevent our boys from going back to fight and burn the village.

On December 10 we reached a small lake called Odah. From the contour of the land, which showed the well-marked dip of the old shore, this lake had once been a very large sheet of water. Here we had some good duck and geese shooting, and I was also lucky in getting an "ant-eater," a small but very rare animal. A lofty mountain range called Garamaldit stretched many miles east and west just south of our course. During our next day's march my mule ran away for the third time, coming to grief in a fox-hole, but neither of us was much the worse apart from some bruises. I had hopes that this fractious animal would settle down with careful handling, but after this I christened him "Oom Paul," as I had no hopes of his mending his ways until one of us had come to grief. On December 12 we crossed a river called Mukla, rising in the lofty mountains to the south, of which the highest is known as Mount Assobat. Rising ground all the 13th brought us to Dunkaga (3770 feet), the 14 miles having been done under terrible heat. Next day we made a forced march of nine hours, doing 18 miles over an endless plain called Aleaduga, on which we saw thousands of camels feeding, and also met with our first zebra, oryx, and hartebeest. We finally camped at Bilen hot springs. The temperature of the water was 110°, springing up in a pond about 30 yards across, clear as crystal. We enjoyed an evening bathe here, while just at dusk the banks all round would be covered with sandgrouse. Half a mile further on this water ran into a huge swamp some 2 miles long by 1 wide, covered with dense rushes 10 feet high. In this place we located the only herd of buffalo met with until we reached the lower end of Rudolf. We stayed

three days, trying every means which might enable us to shoot a specimen, but without luck. We tried machans at night; we tried walking round the outskirts in bright moonlight, and nearly with success, but just after seeing some feeding at about 2.15 a.m. on December 17, an eclipse of the moon took place, and the darkness spoilt our stalk. A most curious fact about the eclipse was, the shadow started covering the moon from the right top corner; on clearing things were exactly reversed, light first appearing on the left bottom corner, and the last dark spot clearing from the right top. Mr. Whitehouse noticed the same from a place 3 miles distant. We attempted to follow the buffalo on their narrow tracks, up to the waist in awful slime and green mud, the accumulation of centuries, judging by the smell. As a last resource we organized a grand drive, while we took likely stands in main tracks. The expenditure of five hundred blank cartridges and much shouting only resulted in two of our beaters getting tossed, luckily with no serious injury; so we had to leave Bilen beaten, but vowing vengeance against the buffalo should we ever come that way again. Round the swamp we found our first lion-spoor. Building a zereba with our lion donkey tethered outside resulted only in quite the most unpleasant night possible. Oh, the mosquitoes! Their size and avidity for the Anglo-American blood! Several side trips gave us a good idea of the country. About 5 miles north-west we came across the bed of the Hawash river, just across which were three extinct volcanoes. A few miles further we discovered a lake called Lihadu, fed by the Marion river running from Abyssinia, while the outgoing river, the Arthso, is said to join the Hawash some miles further north. The river here was obstructed a good bit by sandbanks, on which were basking numerous crocodiles. A small lake of fresh water we called Kemp lake, numerous small streams from the Dofat valley running into it, though we could find no outlet for its waters.

On December 19 we reached the much-talked-of Hawash river, a fine broad stream of 90 yards in width, deep, with a fast-flowing current; this river is another which is said to run out and disappear some 70 miles further north-east; such a volume of water, one could hardly believe it. Here our Berthon boat became decidedly popular, especially as crocodiles abounded. We found at this camp our first fresh elephant-spoor, and, being keen to procure some ivory to take up as a present to the emperor, we all separated and entered a 3-mile patch of dense African jungle; huge prickly aloes, enormous cactus with long sharp points, and a tall feathery plant like privet, made up a safe asylum from ordinary mortals. Very few minutes sufficed to turn hunters into hunted. No. 1, a cow, charged down on us. Jumping aside, I killed her as she rushed on my shikaree, not 4 feet from him. Hardly had we struck the spoor of another lot, when a young bull suddenly bore down on me; however, a lucky forehead-shot laid him low. While

skinning one of these heads, the whole place seemed alive with elephant crashing towards us. Seizing my rifle, I ran ahead to try and cut off the troop, when suddenly a line of over forty elephant broke cover, about twenty-five in the first line jammed together like a cavalry regiment charging. Being only 20 yards from me when they appeared, with the centre bearing directly down on one, I own to feeling they had the best of me. I saw my only chance was killing a flank one; in a second I dropped the left-hand one, which, falling inwardly, inclined the whole troop a little to the right. Within 10 yards I fired my remaining barrel, dropping another, causing still further deflection to the right; another second the flank one on the left rushed past, almost knocking me down. I felt thankful for such a lucky escape, and blessed my new ·450 cordite rifle by Rigby, which had done such good work, five elephant in six shots unquestionably proving its value. I found, on returning to camp, Whitehouse and Butter had both undergone similar experiences, and I felt bound to apologize for introducing them to their first elephant—such elephant, and in such a jungle! We stayed at the Hawash river camp till Christmas Day, spending Christmas Eve again sleeping out for lion. Early Christmas morning we moved, cutting off a big bend of the river, and as we approached the banks we were a little alarmed to see scores of armed warriors galloping in from all directions. We at once took the precaution to form up and wait for stragglers. In the mean time we found they were only a large party of Gallas hunting; they were fine men, and splendidly mounted, but entirely nude, excepting a few who wore a bit of skin on the shoulders. Having never seen a white man before, they exhibited much astonishment at our boots, thinking they were our feet with only one toe! The river here was 5 feet deep, with a strong current; despite crocodiles, Clarke took his clothes off and swam over. A few hundred yards and we again had to cross the Kassam river, banks 30 feet high and very steep. We decided to camp on the bank at a place called Lamafun, all around being thick bush. From our camp we had a fine view of Mount Assobat due East, while a fine-looking pile to our west obtained the name of Clinton range. We prepared a sumptuous Christmas repast that evening, ending up with plum-pudding carried for the occasion; while a bottle of champagne was taken from the medicine store (no liquor being carried except as medicine), in which the toast of home and absent friends was drunk. Retiring to bed at 10.30, my friends did not love me when at 1.45 a.m. the morning trumpet sounded, but on a long trip the camels must be considered before anything else. A short march brought us once more on to the main track from Harrar to Adis Abbeba, and it seemed funny to suddenly run against a telephone wire, which the emperor has up to the capital from Harrar.

On December 27 we again reached the banks of the Kassam river, the road crossing many deep ravines, but beautifully shaded by large

mimosa and other trees. We halted under some big thorn trees at a place called Tadechamalka, and at once set all hands to work making a large zereba, as we intended giving the camels a well-earned rest while we journeyed up to pay our respects to the emperor. Clarke stayed behind in charge of the camp, glad to have time to go over all his work, and complete his mapping up to date. With about six boys and Mohamed we started for our 100-mile ride, camping at Choba, alt. 4800 feet. At Balge, situated on a high plateau over 2000 feet above the country below, we began to feel the cold terribly, added to which it rained daily. Passing Chaffe Dunsa, and Akaki, alt. 7800 feet, we at last arrived at the capital on January 1, proceeding direct to the English compound, where we were most warmly welcomed by Colonel Harrington, who not only supplied us with numerous tents, but made us his guests for ten days, during which we had a most delightful time. On New Year's Day we all dined with the Italian minister. On January 5 we were received by the emperor, who was most kind, and promised every assistance through his country to Rudolf. We bought five fresh mules, two Abyssinian horses, and a flock of 100 sheep. On Sunday, January 7, being their Christmas Day, the emperor most kindly asked us all to dine in the huge hall called Abderash, a building about 190 feet long, 90 feet wide, and 35 feet high. All the ministers, ras, and principal generals were present on the raised daïs round the throne, while in the body of the hall about 30,000 soldiers were fed in two detachments. Our menu was as follows:—

Milk and rice soup. Kabobs of meat and potatoes. Omelette and herbs.
Mince and artichokes. Fillets of beef and radishes.
Kabobs of mutton and cabbage. Fried brains. Fried mince and maccaroni.
Smoked beef and lettuce. Brown rolls and flat bread. Coffee.
Honey beer. French claret. Arrack. 12-year-old teg and Epernay champagne.

After dinner we shook hands, and, through an interpreter, thanked his Majesty for so much kindness. He replied, "May the Lord keep you well, and may you return safely to your own country. May you have good shooting and a pleasant journey through my country."

On January 9 we all turned out to meet the emperor for a trial hunt with hounds, and also with two horses sent by her Majesty the Queen to the emperor. We were lucky enough to find and kill a jackal, which much pleased his Highness and the thousands who escorted him. The emperor then returned to the English compound, where hospitality was dispensed by Colonel Harrington. On January 10, accompanied by Mr. Baird, we bade our kind host farewell, agreeing we had never spent a more enjoyable ten days. We reached our main camp in three days, and found many boys down with fever. Here we remained four days, packing all our trophies to send back to the coast, getting rid of all useless baggage and cutting our men down to fifty. Mr. Powell Cotton had lately decided to leave the party

and return to Adis and work north after ibex, of which I since hear he obtained three specimens. On January 18 we made another start, passing by more of those wonderful boiling springs. A few miles further on, having left our course to climb some high ranges, we suddenly came on the ruins of a large town and fort called by the natives Hallam, said to have been built about 900 A.D. by the emperor Zarakob, who was defeated by Granya. It is a wonderful place, laid out on the summit of a lofty hill, the walls, 3 feet thick, of loose piled stones, all now levelled to about 3 feet in height. One could still trace all the foundations of the houses, with streets winding in and out. The town covered a space one mile long by half a mile broad. On January 19 we camped at the Mathara lakes. Though not far apart, the large one was quite salt, while the small one, Edith lake, was fresh. We had some terrific climbing in an attempt to get across to a small mountain for survey work. Recent volcanic eruptions had simply strewn the whole country with enormous blocks of lava, while masses of solid rock of all sizes, up to 15 feet square, had been thrown up and scattered thick as hailstones. I cannot imagine a rougher climb in the world, and only two got through, though many started. This march left the fine pile of the Fantali mountains just behind us; for weeks their highest peak had been one of our survey points. A long march next day brought us to the Hawash river again. This country having never been visited by white men, we were again the objects of great interest. Though the valley afforded good grazing, it had very few inhabitants, while the south bank was densely covered with mimosa bush. The whole country abounded with the camel poison tree, which alone entailed endless labour and anxiety.

On leaving Oresa we found the first cultivation—peas, cotton, maize, and barley being grown, while the district was densely populated with Arusi Gallas, occupying large villages called Oresa, Wargi, Korri, and Wagia; but even here drought was beginning to tell its tale. We shot two hippo while camping on the river; and encountered an Abyssinian gentleman, who, having nothing else to sell us, tried to sell his wife. After repeated attempts, he and the good lady, looking crestfallen at not even raising a bid, proceeded on their journey. Our spare time all along this valley was fully occupied with prescribing for every kind of ailment; the chief being bad eyes, for which, unfortunately, we were quite unprepared. We had now for some time a splendid view of that grand mountainous mass called Zakwala, 10,000 feet above sea-level, this and Fantali being of great assistance in our survey work. We passed a small sweet-water lake with no name, but covered with wild fowl, arriving at Gogo near Lake Buffa on January 26. Here we rested our transport for a few days while we made a side trip to ascend Zakwala, some 22 miles distant. Leaving our mules at the foot of the mountain, we began our hard task. At an altitude of 8500 feet we

stopped for lunch, and admired the grand view. Butter and Clarke, both born mountaineers, pressed on to the summit, which had once been an old crater, but now forms a pretty little lake, called by us Butter lake, about three-quarters of a mile in circumference. Rising all round from the water's edge are the sides of the crater, in places 600 feet in height. On the lake dwell a priest and several hermits, while on the eastern slopes are several villages ensconced in crevices of the rocks. The hill is considered holy, and boasts of three churches, one in ruins, while the whole place rings with superstition. For instance, the hermits go daily to pray at a curious chasm in the rocks, the legend recording how in olden days a pious hermit ascending the hill met the devil, whom after a severe struggle he conquered; so, founding a chapel, he settled down there, people coming from far and wide to cure disease by bathing in the lake. The whole country round was under the rule of Fiterauri Apta Mariam, who has the right to administer justice for all offences excepting murder, which rests with the emperor. As usual, the women do most of the work, weaving a great deal of the cheap calico, threshing out corn with curious flails, while in places they carry all the water on their heads for miles.

At Gogo we said good-bye to Baird, from whom we much regretted parting, for a more cheery companion or better sportsman it would be hard to find. We found sickness rife in camp, twelve boys being bad with fever. It is wonderful how food and no work plays havoc with a whole caravan. On February 1 our boys were all looking out anxiously for the new moon, which heralded their Christmas Day (making the third we had kept) and ended Ramadam, their month of fasting. We got fine views of Mount Sitala to the south, also the smaller peak Arbora. We camped at Gafartha, in the middle of the Bugra plain, covered with wretched grass and half-dead bush—no water. A side trip of a few miles brought us to three small fresh-water lakes, which we christened Queenie, Gladys, and York lakes. Another 12 miles took us across the river Maki, which feeds Lake Zwai. The grass round here had been lately burnt, making us terribly black and dirty. Next day we reached the shores of Lake Zwai, 5400 feet—a fine sheet of water about 25 miles long, full of hippo and wild-fowl. Here we had very bad luck, our camels having the previous day got to the gumbot tree. By this we were delayed a week, during which we were kept in terrible suspense. All the camels were affected, several went mad, others were unable to get up, and it really looked a hopeless case, for we had no chance of replacing them. We promptly killed two sheep, and with boiled durra drenched them twice a day with strong soup; we also tried firing them. We lost a pony here from horse-sickness. Luckily, our camp was among countless herds of game—hartebeest, Grant's and reed bucks chiefly—so we had no need to consume our stores. The natives belong to the Waiyu tribe of the

Arusi Galla—a good-looking lot of people, especially the women; one sees among them good noses, no thick lips, but good features altogether. The men wear clothing, armlets of ivory or copper, necklace of beads, and feathers in the hair; they are armed with clumsy ill-fashioned spears, also a huge chopper-like knife with a round end rather like an Indian cookie. Terrific thunderstorms visited us night and day. We were lucky in being able to purchase twenty-five really good donkeys; so on February 10, finding forty-nine camels better, though very weak, we again moved on. I estimate that, through our boys' carelessness, the poison cost us twenty good camels—a serious loss. To the west Mount Gobeha stood out, a notable landmark above the dense bush and forest covering all this country. Most of the inhabitants had never seen a camel; imagine their fear and astonishment, while their ponies and mules simply went mad and bolted. We next passed Lake Horai, to the east of which lies Lake Seveta; during the rains both join and form one large water. The river Suksuk joins Zwai and Horai. Another river joins Horai and Lamina, while Mount Alga divides the two waters. A curious thing was that the lake-water, of a pretty green colour, though quite sweet, refused to be forced through our filters; close by the Gidu falls the water was brick-red. The Tuka Gallas are all great hunting people, hardly doing anything else; they inhabit the western shore of Horai.

Travelling along the foot of the Kambata range, we crossed many running streams, and a country densely populated, the chief tribes being Adarri, Waragi, and Gurage; all seemed well-to-do Galla. We had now to leave the low country and face the steep hills of Ulamo. After two days' incessant climbing up and down ravines, we emerged on the fertile hill on which the chief village of Ulamo is situated. How pretty all the country looked on these hillsides, green with young grass and many kinds of timber; hundreds of kraals, each in its own little plot, surrounded by banana and palm trees; while cotton, limes, ginger, and a vegetable called "godaris" grew in profusion! The mountain-sides to the topmost peaks were cultivated, the bright red patches of soil glistening in the sunshine. Many sorts of lilies and other flowers, besides innumerable gay-plumaged birds, met our view on every side. Market-places abounded—every two miles—and thousands of natives collected daily at each. We camped near Mount Dalbu, 6700 feet, the mountain itself towering to a height of 10,400 feet. To the west stood out a fine range of hills with three peaks, which we called Brandesburton range; while further south an unnamed mass of hills was called Whitehouse range, a continuation of which, a mass of mountain much broken up with deep ravines, was christened York range, with a notably high peak, James peak. We here found quite a new currency—thin bands of iron 2 feet long, 1 inch wide, sixteen of which go to the Abyssinian dollar; they are called "dorma." The shum being absent, his headman

brought us abundance of presents, which, of course, we returned by other gifts. Next day, February 22, we got our first view of Lake Margherita. I forgot to mention at Ulamo (which, according to Captain Wellby, is "devil-haunted") we tempted Providence by taking all our meals in the presence of hundreds of spectators, but with no ill effect. The legend runs that any one seen eating by Ulamo people goes mad; what we were nearly prevented from doing, was eating at all, owing to the countless swarms of bees which invaded our table.

We next traversed the district of Baroda. Rain every day made the roads almost impassable; climbing up and down mountains 5000 feet in a march almost broke one's heart, and several camels sank down to rise no more. At Baroda a priest and his acolytes joined us, and, clad in their vestments with coloured umbrellas, accompanied us on a 7-mile march; singing and chanting, they refused to be shaken off till we halted and unpacked the dollars! On February 27, after terrible hillwork, besides a couple of miles of road over swamp, we were met by Fiterauri Doris's headman, accompanied by 277 natives bearing presents; these were merely for that night's use! But oh, the cold, despite our roaring bonfires! We were 8900 feet up, in thick fog and rain, quite among the clouds. Next morning half our camels could not get up till we had lighted fires all round them and thawed the poor beasts. But our hill troubles were nearly over for the present, 100 natives coming to carry some of our kit and ease our camels. Next day a deep river, followed by wet and uphill climbing, quite demoralized our caravan. I had gone on ahead, muddy and wet through, and, with only three boys, was dragging along some fifteen weary camels, when, surmounting a hilltop (9400 feet), I suddenly came upon a very pretty picture. Our track lay between two banks, each of which was crowded with people. Fiterauri Doris was there, with all his officers, and 700 soldiers clad in their bright-coloured garments; mounted men were dashing about to keep back the crowds of Gallas, while hundreds of horses and mules with gay trappings were standing about in groups. Of course I had to pull myself together and look my best. After warm greetings, I was led towards a fine mule, possibly a splendid hack when you got on, which I never did. Abyssinian stirrups are 2 inches wide, and what with my shooting-boots, and the mule's kicking and rearing, I never got within 3 feet of the saddle. However, my kind host gave me a more reasonable mount, and the *cortège* proceeded to the site fixed on for our camp. How I longed for my companions to be with me! but unfortunately they were behind. The presents were carried by 531 men, women, and children as follows: 181 grass, 146 firewood, 89 bread, 61 ghee (butter), 15 honey beer, 12 honey, 8 butter, 10 grain for ponies, 6 chickens, 2 cows, 2 camels, and basket of eggs. Our presents in return were a sword, revolver, bottle of kümmel, blankets, razors, and scissors. We were most pleased when our kind host

told us not to load our camels any more among the hills, and sent us about 500 Gallas to act as bearers. During this march we crossed our highest point—just over 10,000 feet, at which level we found, to our surprise, bamboos, blackberries, daisies, tiger-lilies, and trees covered with ferns. It was quite one of our most interesting marches. Arriving at Dincha, our worthy host, Basha Islamani, took us in hand; his presents were 2 cows, 9 sheep, 408 grass, 356 wood, 13 ghee, 7 honey, 153 wine, 97 baskets of bread, 1 grain, 4 curry pepper, 12 chickens, 31 eggs, carried by a grand total of 1093 people. We were again supplied with a fresh relay of porters, one Abyssinian soldier looking after every 10 Galla.

This day's march was more of a slide than anything else, for in less than 7 miles we climbed down 3888 feet; for this porterage we had 800 Galla men. We camped once more on the flat shores of Lake Margherita, or, as the natives call it, Aballa, and at the south end Nai Chaba. A short march brought us to a pretty sheet of water 20 miles in length called by the natives Abaya, and by the Abyssinians Degurabe. We found here a small village, the huts of which are built either on lofty poles in the lake or in the trees on the edge; they are a poor feeble-looking race, living entirely on fish. While camping here we heard of elephant in the dense jungle-grass; we all went off in a body, and, after much walking and continual climbing of ant-heaps, we located a troop of about twenty feeding towards us. To watch them ten of us crowded on top of one small ant-heap, each holding on to another. We kept quiet, and the wind being right, the troop gradually fed to within 40 yards of us, when, getting our wind and scenting danger, they ranged up in line, with trunks waving, and seven baby elephants close to their mothers' heels. Things began to look unpleasant, so I was deputed to try and scare them. Picking out the largest bull, I dropped him dead with a shot in the brain; this caused the rest to stampede, and released us from what might have been a most awkward and dangerous position had the cows once placed us. However, it was a sight well worth seeing, and one never to be forgotten; but how we cursed our luck to find all our cameras back with the ponies! At Gardula we camped in the middle of terraced gardens, all the hillside being levelled up by thousands of low stone walls; none of the plots are more than 6 feet wide, and yet hundreds of miles are treated in this manner. Here we were courteously entertained by Fiterauri Waldo, who now represents the last Abyssinian outpost; owing to the fearful drought, the more advanced posts at Hammer Koki and on the Omo have all been forced to retire. This officer has 1500 soldiers under his command, who spend all their time killing elephants for the emperor; he told us they alone had sent 1500 tusks to Adis in the last two months, which possibly accounts for the few we found. March 10 to 12 we camped at Godigea, on the river Manta. Here some high hills were called Beverley range, and a particular lofty pile Mount Clarke,

which our keen surveyor climbed; while due west of Gorso, far down in the big valley which forms the watershed towards Lake Stefanie, we named a pile of mountains Faskally. After traversing the whole district from Gogo and Buffa lake to our present camp, we came to the conclusion that the entire country was once a vast sheet of water, connecting the whole chain of lakes with an outlet at the gorge south-west of Godigea. This part of the valley has formerly been all cultivated in cotton-fields, but it is now neglected and devoid of population. We found our first rhino here, Butter killing one and Whitehouse another; the latter, unfortunately, getting his shikaree, Darod Nur, badly smashed up before he killed it. Having set a broken leg and dressed the other wounds, we sent him back to our kind friend, Fiterauri Waldo, who nursed him till well enough to send down to the coast.

While waiting, parties of men had tried to find a road for camels to the west. It seemed quite hopeless till at last we discovered the bed of a small rocky stream. Even in this, the rocks twice narrowed to only 3 feet apart, so we had to unload and blindfold all the camels before they would pass through these narrow chasms. The next few days disclosed terrible sights. All along, lately, we had seen single skeletons on our route, but now huge villages, such as Gorso and Dalbana with many others, could not boast of two living people in each. We passed hour after hour through silent cities of the dead, counting six to eight corpses laid together, while inside the kraals you could see the whole family just as they had perished, the last having crawled and dropped almost on the embers of the fire. The few people living were crawling about, eating the young shoots of a certain weed and digging up grass roots. The fearful stories we had heard at Adis Abbeba came back to us, and from what we could gather things ahead looked bad; still, though several times hard pushed for water, so far, among the hills, we had suffered from too much rather than too little. March 15 and 16 still found us travelling through similar sad scenes. We named our last camp in the hills "Desolation," and close to it we suffered a serious loss through one of our best camels, which had carried unchanged from Zeila 280 lbs. of rice, falling over a steep precipice while on the march. Falling some 90 feet sheer down, and then rebounding another 50 feet, the poor beast's remains were found fast wedged between two rocks. Our last big climb (6600 feet) we did this march, coming out on the bed of the Galana Sagan river (2700 feet) on March 16. You cannot imagine what getting on to level ground once more meant to us. As we looked back on those lofty mountain ranges, through which we had had to cut our way for three days in dense scrub, we thought of the five weeks spent climbing up and down thousands of feet almost daily, and wondered we had a camel left alive.

We now found ourselves in a valley about 6 miles wide, the Hammer Koki range opposite. This valley used to be the home of huge

elephants, but, alas! they are about a thing of the past, cleared out by the constant shooting of Abyssinian soldiers, who are now following the ivory right through the Boran country. I procured one big fellow here; unluckily he only had one tusk, 94 lbs. in weight when fresh cut out. Here we found existing maps in great error. The big Galana Sagan is shown as running into the Dulei river, whereas it really runs into the valley, and then, spreading out, disappears in all directions, as we found to our cost. The river joining the Dulei further south, and said to be the Sagan, is a different stream rising close by among the mountains on the east, which I called after myself—Harrison range. All these streams were quite dry, though during heavy thunderstorms the whole country was a running sheet of water 6 to 12 inches deep. We had terrible work, our whole caravan being one night and day penned up on two small antheaps. For three days we were stuck fast, losing three or four camels when trying to move only a mile. Following the valley south, we kept a sharp look-out for Lake Donaldson, but found later on we had traversed the whole length of it unknown, all being covered with bush. We concluded that during very rainy seasons a great deal of the land was flooded, but as a lake it was quite undefinable. We now saw ahead, as far as the eye could reach, nothing but a vast extent of ground strewn with shells and heaps of fish-bones. "Stephanie—dry!" we all said; and a thunderbolt in our midst could not have caused more consternation. The sieves had all been burnt, and most of the roots dug up. We afterwards found about two hundred Boran people still living here. They dug up these sieve roots and ground them up, eating them instead of meal. To us it looked like sawdust. We ascertained that the last of Lake Stefanie had dried up about Christmas. We camped near some deep holes dug out to drain the last of the water, but now containing 18 inches of water from the late rains. Terrible was the result of drinking this, for next morning only ten boys were able to move; over forty lay suffering agonies. Luckily, we had used our barrels of rain-water. A move was bound to be made, but half the day had passed before we were loaded up, and then commenced a weary hot march due east for the mountains.

On first reaching the lake we spied some natives, and after an exciting chase two were led in unwilling prisoners; but what a change came over them on finding we were English, and not their dreaded Abyssinian neighbours! They at once guided us to the water-holes, and then went to summon their headmen. From these we learned that most of the inhabitants had died, others having gone up north to the Omo. The worst news was still to come, for on asking if there was good water in Lake Rudolf, they replied there was water, but any one drinking from it died. This seemed a confirmation of all the worst rumours yet heard. Personally, I still felt convinced that a sheet of water over 200 miles long could not be so quickly rendered unfit for

drinking. Still, it was a cause for much serious reflection. So far, owing to the daily thunderstorms, which the oldest inhabitants said they had never before known to occur at that time of the year, we had reached Stefanie; without them we could certainly not retrace our steps, though we now knew the country; while if they gave out and Rudolf was poisonous! Well, neither happened. On the fourth day we camped on Lake Rudolf, according to our marching distances 45 miles from Stefanie. For the present our maps are not completed further, owing to an error of the chronometer, a thing no one can guard against; the remaining 600 miles of valuable work to Rudolf, and then down its East coast *viâ* Lake Baringo to Uganda, has to wait till another fixed and corresponding observation (shortly expected to be made) can be obtained, when the rest of the work done will be adjusted in accordance. A curious incident happened here. Mahomed had often told us of a pure white topi he and Captain Wellby had seen and tried to shoot. Sure enough, as we were pitching camp in a heavy storm of rain, our white friend was feeding a mile away among thousands of the ordinary topi. Knowing it to be almost hopeless, I still went out, and at once the whole drove started moving. An hour later Butter came in in great excitement, saying he had shot the white topi. It appears his shikaree had noticed it, and, getting behind an antheap, he was lucky enough to drop it with a very long shot with his mauser as the troop streamed past—splendid luck!

My first act on camping was to send off two camels for water, as the nearer I got to the lake, the greater my anxiety became. I felt ten years younger when the word was passed up, "Water good." On March 31 we left camp early and rode up to visit the Omo at Murle, having decided, if this big river was dry, to work out south by the lake to the Uganda railway. All the thick scrub and timber which should have been alive with elephant, was almost dead, with never a sign of living beast or bird. Passing deserted villages, we came on to the banks of the Omo, and with sad hearts ate our lunch in the middle of the dry stream, while our mules fed on the green luxuriant grass, which had completely covered the whole dried-up bed, till it looked more like some green glade in a forest than the important Omo river. Having scouted round the whole country-side in hopes of finding some natives, we returned, and with difficulty selected a single tall thorn tree near Murle. Sending our shikarees up with axe and saw, we dressed all away, leaving only a centre arm, on which we hoisted the English flag; doing so at the request of Colonel Harrington and with the acquiescence of the emperor, to denote the Abyssinian and English boundary-line. Had we been able to discover any inhabitants, we should have hoisted a second flag further north. Needless to say, as the flag went up the whole party sang "God save the Queen," a bottle of champagne having been brought along in which

to drink her Majesty's health. On carefully examining Rudolf, we found its level had sunk 12 feet during the last year, while in what appeared as three stages (no doubt years) the lake had lost 28 feet. Naturally this had dried vast tracts of country, many of which we tried to cross, but found it hopeless, owing to elephant spoor 18 inches deep, now hard baked and grassed over, forming death-traps to our camels. Enormous herds of game, including topi, zebra, oryx, and Grant's gazelle, covered the hard-baked, flat, dreary-looking country which borders the whole lake on the east side, while rhino were a positive nuisance; of buffalo we only once saw five, halfway down the lake; giraffe were seen at the north end, and again below the south end. Lions seemed plentiful by the spoor all along, but we could not afford to give up time and wait for them. The heat was terrific, and Clarke was unfortunately taken seriously ill with fever, which laid him up for some days. We had several excitements on our march along the lake. A lioness I had crippled suddenly charged down on us while photographing her with a binocular 12 yards off. We all jumped different ways, and she just missed my boy, but caught my best cordite rifle, breaking one trigger off and discharging both barrels. I luckily finished her before further mischief was done. Then four rhino came down to drink at pools close by our camp. They charged among our cows, donkeys, and goats, stampeding the lot. Another day, which nearly proved to all of us our last, we met our last lot of elephant, in dense bush. A cow with baby calf, the worst I ever met, simply hunted the lot of us. Butter and Mohamed hardly know how she did miss them; Whitehouse and his shikaree plunged under a thick bush; while she tossed his second shikaree over a 10-foot bush, and put her foot on Whitehouse's hat and glasses close to where they had scrambled. Then, as to myself, after dodging her twice by a few inches only, I shot her 7 yards off as she charged a third time. We then returned to finish our lunch, agreeing we had all had enough "being hunted" by elephant for one day.

On April 6 we buried the only boy lost on the whole trip. Five starved Galla had joined us six weeks before, asking to work for food, and capital fellows they turned out. This poor fellow got fever badly, and, after being out of his mind fifteen hours, died, so we covered him over with brushwood, and heaped stones above. We had a heavy roll of sick men all along the lake; it took all our extra mules, donkeys, and ponies to get them along, crossing endless dry river-beds, which in the rains must carry an enormous bulk of water down into the lake. Our whole journey was in sight of the lake, excepting April 10 to 13, when we passed east of the mountains, the streams still running into the lake. On the 14th we came to a small fishing village, Burkeneji, and, seeing figures moving about, hoped to have speech with them, but before we arrived they had embarked all their chattels

on board five dugouts, and stood out to sea! Two days more brought us opposite a huge mountain called Kulab. We stayed here a day so that my companions might go and hunt for big koodoo; Butter had fine luck, bringing back a perfect beauty, horns $52\frac{1}{2}$ inches. I in the mean time had been prospecting our road ahead. Next day my mule, "Oom Paul," quite eclipsed its former achievements by galloping away down a rocky precipice, over which we both got a toss. I was at the time snapping a photo of the lake with my binocular, which the fall smashed in two—bad luck, as it fogged and spoilt the plates on which I had taken the lioness charging. On April 19, when abreast of Teleki's volcano, we bade farewell to that vast sheet of water, not without a certain regret, I own; at this point we struck Lord Delamere's old track, and by what we had done I could realize the task he had performed. Of course, much rock-moving had to be done, but we had the line of the road, which was a great help. On reaching Mount Nyirobuk, we encountered the Boma and a tribe called Lokuba. Clothing was quite dispensed with; slitting the ear, they insert a large round piece of wood, or some swells prefer four brass cartridge-cases. Hair-dressing is practised in many styles, some having it down to their waist, but small curls smeared and plastered down with a red brick-dust looked best. They wear iron armlets and beads, live by hunting, and use bows and poisoned arrows, with long spears. The next tribe, called Semirides, own large flocks of sheep and cattle. They are a well-built and good-looking race.

Passing through the Narrow valley, which contains splendid grass, but few inhabitants, we again got some heavy hill work—April 29, 7250 feet; April 30, 8400 feet—and began to have heavy rains, which made us anxious to push along. On May 3 we travelled across what years ago had been a huge lake running right up to the foot of the range of mountains to the east. On May 6 we saw the lofty peaks of Mount Kenia, some 90 miles distant, glistening in the sunshine. On the following day we had a lovely view of Lake Baringo stretched below us, and a steep climb we had getting down, then several deep and swampy rivers intervened before we brought up at a large prosperous village, called Nyems, 3300 feet. We found here a Swahili trader, who volunteered as guide to Naivasha. On May 11 I killed my last rhino, and the same afternoon we camped at Elmolo, on the main road from Uganda to Mombasa, and what a luxury it was to travel once more on a well-kept road, with decent bridges and a telephone wire! At this point Clarke gave up any further surveying work, the rest being well known. On May 13 we reached Lake Naivasha, where several English people connected with the railway kindly entertained us. Pushing on, we reached Railhead on May 15, having done 103 miles from Lake Baringo in four and a half days—a fine performance, after our camels had done 1453 miles at an average of $11\frac{1}{2}$ a day. I consider we had wonderful

luck with our animals; for owing to the enormous amount of rice we carried for the boys, they were heavily loaded. Our losses were thirty camels, two-thirds being entirely due to the poisoning episode; one pony, from horse-sickness; one pony and one mule ran away and got lost; one donkey eaten by lion, and one shot, being lame. We sold all our live stock at Railhead, the railway buying the mules, while Indian traders took our camels. It was with great regret we said good-bye to those best and most long-suffering of animals, which had shared our ups and downs through so many months—one camel having carried a 280-lb. load of rice through from Zeila without a break, which our boys said, was an unheard-of performance. Knowing the difficulties we met with on account of rains, the awful mountain ranges to cross, the never-ending fear of poison, want of any feed the first two months, with the endless marching, and last, but by no means least, sore backs, one can only say it was almost a miracle to get through. We quite expected to be able to replenish our transport both among the Borana people north of Rudolf, or, if south, from the Rendili; but, alas! all these supplies had vanished.

I cannot close this paper without once more calling attention to the splendid work done by our Surveyor, Donald Clarke; no day was long enough for him, and no mountain too high to be climbed, after ever such a long weary march and in the heat of the day. One feature we particularly admired was, he never would insert a yard of country unless seen by himself or vouched for by one of us. When in camp his kind cheery manner endeared him to all, while his skill in doctoring was only equalled by his skill in the cooking line. It is owing to his absence on the West Coast of Africa that the error of the chronometer, before mentioned, cannot be rectified in time to publish the portion of his work beyond Lake Rudolf.

Taking the first train, we duly reached Mombasa, where we shipped all our boys direct to Aden, we ourselves having, on account of the plague at Aden, to go home *viâ* India, a month's longer journey. Excepting Clarke, none of us had a day's illness; but on the steamer, when close to India, we all had a touch of fever.

THE NATIONAL ANTARCTIC EXPEDITION.

THE sailing of the *Discovery* from Cowes on August 6 marks the successful close of the first stage in the great undertaking which has more or less occupied the minds of geographers in this country for the past eight years. Since November, 1893, the supporters of the proposal for the renewal of antarctic exploration, among whom our President, Sir Clements Markham, has from first to last been the moving spirit, have

been untiring in their efforts to secure the despatch from our shores of an expedition fully equipped for the execution of the important scientific work offered to investigators by the unknown region surrounding the south pole. In spite of much difficulty and discouragement, those efforts have now been crowned with success, so far as the work of preparation is concerned, by the despatch of the best-equipped expedition which has ever left this country for purposes of antarctic research. Much remains to be done by those at home to ensure the continued support of the expedition from its base of operations in this country, but it is to the intelligent and zealous commander and his capable staff of officers and civilians that we must now look, in the confident expectation that all that brave and determined men can do to make the undertaking a success, will in any case be done.

The *Discovery*, which since her arrival from Dundee had been lying in the East India Dock, cast off her moorings at 1 p.m. on Wednesday, July 31, and after being turned in the dock by the tug, proceeded down the Thames under steam, *en route* for Spithead, from which the final start was to be made. On board, in addition to the officers, scientific staff, and crew, were Sir Clements and Lady Markham, Sir George Goldie, and other representatives of the Royal Geographical Society, as well as a limited number of scientific men and others, who thus testified their interest in the undertaking, and their cordial wishes for its success. During the passage down the river the expedition received an enthusiastic send-off from the various craft in the river, as well as from groups of onlookers from the banks, who had assembled to bid a final adieu to the ship. Greetings were sent from all sides by means of signals, steam-whistles, etc., and were returned by the dipping of the blue ensign, which the vessel was flying. At Greenhithe, which was reached at 3 p.m., boats were in readiness to take on shore the visitors, the *Discovery* then holding on her course with her own complement, minus one or two members of the staff who joined the ship subsequently. Sir Clements Markham remained on board and made the voyage to Spithead, where the King was to inspect the ship before the final sailing.

On Monday, August 5, the *Discovery* proceeded at 9 a.m. from Stokes Bay to Cowes, and at 11.30 the King came on board from the *Osborne*, accompanied by the Queen and the Princess Victoria. Their Majesties were received by Sir Clements Markham, and Mr. Longstaff and Captain Scott were presented. Sir Leopold McClintock and Sir Allen Young were also in attendance. Their Majesties addressed a few gracious words to Mr. Longstaff, and the King then received the officers and civilian staff, who were presented by Captain Scott. The men were inspected, and the royal party went round the upper deck and the living deck, showing great interest in all the arrangements. Before leaving the ship, the king, who was in the uniform of an admiral of the fleet, addressed the officers and men to the following effect:—

"Captain Scott, officers, and men of the *Discovery*,—I have had great pleasure in visiting this ship with the Queen, because of the interest I take in the Antarctic Expedition and its objects, and in order to wish you all God speed. You are going on a service from which, I believe, great results will accrue. I have often visited ships in order to say farewell when departing on warlike service; but you are starting on a mission of peace, and for the advance of knowledge. The results of your labours will be valuable not only to your country, but to the whole civilized world. I trust that you will be able to achieve the great work that is before you, and that you will all return safe and well."

Before leaving the ship, the King decorated Captain Scott with the Victorian Order; and on shoving off, their Majesties received three hearty cheers from the officers and men of the *Discovery*. The explorers left Cowes on their adventurous voyage at noon on the 6th.

It is unnecessary to add anything to the statements as to the programme and aims of the expedition, which have already appeared in the *Journal*. We give below a complete list of the officers, scientific staff, and crew, making up in all a complement of fifty souls. Of these four are naval officers, four (including Mr. George Murray, who goes as far as Melbourne) scientific civilians, two officers of the R.N.R., two surgeons, twenty-four naval seamen, two royal marines, and seven merchant seamen. It will be seen that the scientific staff has been completed by the appointment of Mr. Louis Bernacchi as physicist, and Mr. H. J. Ferrer as geologist. Mr. Bernacchi will proceed direct to Melbourne in September, and there join the *Discovery*, a free passage having been generously granted him by the directors of the Orient line. His excellent work in connection with meteorology and magnetism while serving with Mr. Borchgrevink in the Antarctic are well known to our readers, while the work in the way of geological research already performed by Mr. Ferrer, a young Cambridge graduate, gives promise of valuable results from his new labours in this direction. Mr. Murray has also secured the co-operation, although but for a time, of Dr. H. R. Mill, our late librarian, who will proceed with the ship as far as Madeira, and superintend the inauguration of work in the direction of oceanographical and chemical research. It is only to be regretted that Dr. Mill's engagements have not permitted him to accompany the ship as far as Melbourne, for his acknowledged position as an authority on all matters connected with oceanography and meteorology would have guaranteed the acquisition of valuable results for science.

The crew has been selected with much care. All, both officers and men, are young and vigorous, with the necessary reserve of good spirits to enable them to withstand the depressing influences of the antarctic winter. Special care has been taken to supply sufficient resources in the way of recreation, and a library of about a thousand volumes has been got together, largely through the liberality of various firms of publishers.

The programme for the voyage of the *Discovery* to the Antarctic is as follows: After touching at Madeira, the ship will proceed to the Cape, which may be reached about September 12. In another month, or somewhat over, the vessel should arrive at Melbourne, afterwards proceeding to Lyttelton, N.Z., where the final start for the scene of operations will probably be made about the middle of December, so that the opening of the new year should see the expedition well advanced among the antarctic ice. As has been already stated in the *Journal*, it is considered of the greatest importance that a relief ship should be ready to start, if need be, in about a year's time, for the purpose of opening communications with the expedition, and replenishing the supply of coal and other stores. Funds are still urgently needed for this object, which is one that should commend itself to all interested in the welfare of the absent explorers, and the upholding of the worthy traditions of the nation in the matter of useful enterprise. The unremitting efforts of those who remain at home are therefore still needed if ultimate success is to be attained.

LIST OF THE OFFICERS, CIVILIAN STAFF, AND SHIP'S COMPANY OF THE "DISCOVERY."

1. *Commander*—Commander Robert F. Scott, R.N., M.V.O., F.R.G.S.
2. *Second in command and navigator*—Lieut. Albert B. Armitage, R.N.R.
3. *First executive*—Lieut. Charles W. Rawson Royds, R.N., F.R.G.S.
4. *Second* „ Lieut. Michael Barne, R.N.
5. *Third* „ Lieut. Ernest Shackleton, R.N.R., F.R.G.S., F.R.A.S.
6. *Engineer*—Mr. Reginald Skelton, R.N.
7. *Surgeon*—Dr. Reginald Koettlitz.
8. *Assistant surgeon*—Dr. Edward Wilson, M.B.

Civilian staff.

9. Mr. George Murray, D.SC., F.R.S. (*director*), as far as Melbourne.
10. Mr. J. V. Hodgson (*biologist*).
11. Mr. Louis C. Bernacchi, F.R.G. (*physicist*).
12. Mr. H. T. Ferrer (*geologist*).

Warrant officers (naval).

13. Mr. E. Delbridge (*assistant engineer*).
14. Mr. T. A. Feather (*boatswain*).
15. Mr. Fredk. E. Dailey (*carpenter*).
16. Mr. Edward Else (*ship's steward*).

17. *Chief petty officer*—S. Roper (*cook*).

Petty officers (naval).

18. Edgar Evans.
19. David S. Allen.
20. William Smyth.
21. David Cross.
22. Wm. Macfarlane.
23. Thomas Kennan.

Leading stokers.

24. Arthur E. Quartly.
25. J. Whitfield.
26. W. Laskly.
27. William Page.

28. *Stoker artificer*—William Hubert.

Domestics.

29. Charles R. Ford (*wardroom steward and assistant*).
30. Charles Clarke (*cook's mate and laboratory assistant*).
31. Job Clarke (*wardroom servant*).
32. Gilbert Scott, R.M. (*marine*).
33. Arthur H. Blissitt, R.M. (*marine*).
34. Albert C. Dowsett (*domestic*).

Naval seamen.

35. William L. Heald.
36. Arthur Pilbeam.
37. James W. Dell.
38. John W. Waterman.
39. Frank Wilde.
40. Henry J. Baker.
41. William Peters.
42. J. Williamson.
43. Charles F. Bonner.
44. George B. Croucher.

Merchant seamen.

45. F. Duncan (*shipwright*).
46. H. Meller (*sailmaker*).
47. J. Walker.
48. J. Marsden.
49. J. Masterton.

50. *Dogs' attendant*—Weller.

THE GERMAN ANTARCTIC EXPEDITION.

By Dr. ERICH VON DRYGALSKI.

The object of the expedition is the scientific exploration of the south polar region, and more especially its Indo-Atlantic section. To effect this purpose, the expedition will first of all establish a base of operations at Three Island harbour, on Royal sound, in the Kerguelen group, and then push southwards as far as may seem expedient in the conditions that may arise, as well as after duly weighing all the circumstances coming under consideration. Should land be reached while advancing south, every effort will be made to establish, and, if at all practical, maintain for the period of a year, a station where the vessel may winter.

The departure will be so timed and arranged as to make it possible to choose the most favourable season for the main object of the expedition, which is to penetrate into the south polar region, and there found a station. Hence the expedition proposes, after establishing its base at the Kerguelens, to leave that group in the course of December, 1901. Subservient to this general plan will be visits to ports on the outward voyage, and the utilization of opportunities for research along the route.

The homeward voyage will be begun as soon as the objects of the expedition have been attained in a satisfactory manner. The programme does not exclude a continuation of the voyage for further research within the south polar region after the abandonment of the

station established in those waters. It can, however, be undertaken only if the condition of the ship, of its personnel and equipment may seem absolutely to justify a further advance, and provided also that assurance can be had of an unimpaired reserve of provisions and coal sufficient for the prosecution of such a voyage. The month of June, 1904, is fixed as the latest date for the return to some seaport in communication with Germany, and this date is to be observed irrespective of the consideration whether or how far the aims of the expedition have been secured. The homeward voyage is to be by the shortest possible route, but is at the same time to be utilized to the utmost for research work. Should no tidings of the expedition come to hand before June 1, 1904, the equipment of a relief ship in Germany will be considered.

For carrying out the enterprise, the south polar ship *Gauss*, with all its personnel and material resources, will be placed unreservedly under the control of the leader of the expedition, Prof. Dr. Erich von Drygalski, of Berlin, with due regard to the preservation of life and of the ship. Under this right of control are included all hiring of hands and purchase of supplies which, after the departure of the expedition, may be found necessary for attaining its object, always within its prescribed limits and available funds. This right of control extends also to all those incidental operations which, besides the south polar vessel itself and its full equipment, have been already anticipated and provided for.

The personnel of the expedition comprises, besides the leader, who has been appointed by His Majesty the Emperor, and is to carry out the oceanographic and geodetic work—

(*a*) The scientific members: Prof. Dr. E. Vanhoofen, of Kiel, for zoology and botany; Dr. H. Gazert, of Munich, doctor and bacteriologist; Dr. E. Philippi, of Breslau, for geology and chemistry; Dr. F. Bidlingmaier, of Lauffen, for terrestrial magnetism and meteorology. (*b*) The commander of the *Gauss*, Hans Ruser, of Hamburg, a captain in the Hamburg-American line, appointed with the approval of His Majesty the Emperor. (*c*) The ship's officers: W. Lerche, of Stettin, first officer, R. Vahsel, of Hanover, second officer, both of the Hamburg-American line; L. Ott, of Höchst, third officer; A. Stehr, of Hamburg, chief engineer. (*d*) The crew of the *Gauss*, including two assistant engineers, two carpenters, two boatswains, one Norwegian whaler as ice-pilot, one cook, one steward, six sailors, and five smiths or locksmiths, who have served on sailing-vessels, and are to act as stokers—altogether twenty hands. (*e*) The personnel appointed to the Kerguelen station, comprising: Dr. E. Werth, of Münster, as biologist; Dr. K. Luyken, of Düsseldorf, for terrestrial magnetism and meteorology; Dr. Engensperger, of Munich, as meteorologist; and two sailors.

The south polar ship *Gauss* sails under the imperial flag, and both

officers and crew accordingly wear special badges awarded for distinguished services by the highest local authorities. The whole expedition is an undertaking on the part of the German Empire, emanating from the State Secretary of the Interior, Count von Posadowsky-Wehner. The relations of the crew to the captain of the ship are determined in accordance with the provisions of the Act with regard to seamen. Private subscriptions to the small amount (relatively to the total cost of the undertaking) of 40,000 marks (£2000) have also been contributed for its equipment. But the great sympathy which the expedition has met with in all parts of the empire has further shown itself in numerous gifts and offerings, all of which have been of special value for the outfit of the expedition.

All members of the expedition receive from the imperial revenue the salaries which have been granted to them and made known elsewhere. They are also fully assured against accident and disablement resulting from the climatic conditions. Cases not covered by the Marine Accidental Assurance Act are met by supplementary assurances undertaken by the empire.

The results of the expedition, and the collections that may be obtained by it, are the property of the empire, which provides for their disposal. The scientific members of the expedition will share to the utmost in the elaboration and publication of the results, as well as in the distribution of the collections, and this in proportion to their effective co-operation during the expedition. In this connection their completed memoirs and wishes are to be addressed to the leader of the expedition, who undertakes all further arrangements.

The Kerguelen station is primarily and mainly intended for magnetic and meteorological observations, which, like the same work on the part of the German main expedition, are to be carried out in accordance with the international programme agreed upon with England. This programme has been communicated to all those states which possess magnetic and meteorological stations, as well as to the stations themselves, with a request for co-operation towards the end in view. Numerous stations have already given promise of such co-operation, which has also been undertaken by the station which has been planned by the Argentine Republic for Staten island. Concerted action with the British expedition, as well as with any others that may be despatched by other states, has been arranged for, as far as possible, by the distribution of labour in all other branches of science. In all its fields of research the German expedition is committed in matters of detail to no rigid programme, but is empowered to carry out all such operations as may on the spot be found desirable and feasible, and for which the thoroughness of its scientific and practical outfit renders it fully prepared. The problems connected with the south polar region, and the equipment required for their solution, have already been fully

discussed by the leader of the German expedition at the International Geographical Congress held at Berlin in 1899.

THE ITALIAN ARCTIC EXPEDITION, 1899–1900.*

The closing years of the century were marked by the entrance of Italy into the field of polar exploration, and by the final determination of the limits of Franz Josef Land. Discovered by Payer and Weyprecht in 1873, its southern shores were visited in 1880 and 1881 by Leigh Smith in the *Eira*, and its north-western islands explored by the Jackson-Harmsworth expedition, 1894–97, during which time Nansen passed through the archipelago on his way home. The eastern extension of Franz Josef Land was discovered by the Wellman expedition, in 1898–99, when Mr. Baldwin made a sledge journey to Graham Bell Land, north-east of Wilczek Land, and crossed to its eastern shore. All that then remained to be done was to fix the northern limits of the archipelago, and to search for the King Oscar Land and Petermann Land of Payer, the existence of which had been rendered very doubtful by the observations of Nansen as he travelled southwards to the east of their supposed position.

This was accomplished by the expedition led by the Duke of the Abruzzi, who in July 1899 reached Cape Flora on board the *Stella Polare*. As far as Eaton island, where the *Capella*, having on board Mr. Wellman and his companions, was met on August 6, navigation was rendered difficult by the ice, because the route led through Nightingale sound, but thence northwards the British Channel was quite free of ice on the eastern side, and the *Stella Polare* made a rapid passage up to lat. 82° 4′, when the fog cleared away, and Prince Rudolf island was discovered to the south-east. Northwards the sea was still open for some distance, but as no land was visible in that direction further advance seemed useless; so, after reconnoitring the coast of Prince Rudolf island for a short distance towards the east, the expedition returned to the west coast of the island, and established its winter quarters in Teplitz bay, in lat. 81° 47′ N.

In the early days of September the Duke of the Abruzzi travelled with one sledge round the island past Cape Fligely to Cape Rath. Cape Fligely, which lies, not beyond the 82nd parallel, but only in lat. 81° 51′, proved to be the northern extremity of the island, and thence the coast trends in a southerly direction to Cape Rath. Nansen's Hvidtland was clearly seen from Cape Fligely, each island being recognized, while of

* Abstract of papers by H.R.H. the Duke of the Abruzzi and Captain Cagni in the *Bolletino* of the Italian Geographical Society; revised for the *Journal* by the Duke of the Abruzzi.

the islands marked by Mr. Wellman on his map between Hvidtland and Prince Rudolf island not the slightest appearance was ever noticed, though the Duke spent thirty days at Cape Fligely. In the map in the *National Geographic Magazine*, December, 1899, the islands John Hay, Jesup, Nem Jahnson, are to the north-east of Cape Fligely; they do not exist. Cape Sherard Osborne is not a part of Prince Rudolf island, and no land was descried in that direction. Considering the length of time passed by members of the expedition at Cape Fligely in expectation of the return of Captain Cagni, and that a party travelled thence towards Hvidtland in search of Lieut. Querini and his companions, who accompanied Captain Cagni for a short distance and were lost on their way back, the non-existence of these islands seems to be indubitable. As for King Oscar Land and Petermann Land, Captain Cagni passed over their supposed positions on his journey towards the pole.

Captain Cagni made a first attempt to start on his journey in February, 1900, but the severe cold and details of equipment compelled him to return, and he finally left Teplitz bay on March 11, about the date when Nansen took his farewell of the *Fram* in 1895. He was well provided with dogs and sledges, and on April 25 he had marched as far north as 86° 33′ 49″ in 64° 30′ E. long. about, though the ice at first presented almost greater obstacles than Nansen encountered further towards the east. Worse, perhaps, than the pressure-ridges were the channels which opened in the ice when the wind blew from the west-north-west, and closed again when it veered to south-south-west. A change of the wind in any direction was followed by new channels. Further north, however, smooth stretches were met with, and good progress was made, as much as 20 to 22 miles a day. Captain Cagni decided to return, not because further progress was impossible, but because only sufficient provisions remained to feed the party till they reached Teplitz bay. When he had returned to about 83°, Captain Cagni found that the drift was carrying him rapidly towards the south-west, though he marched as nearly as possible to the south-east. The same experience befel Nansen, causing him some anxiety lest he should fail to strike Franz Josef Land. The result in Captain Cagni's case was that Neale and Harley islands were the first land sighted, and that the party had to make a troublesome journey over the moving ice north-eastwards to Rudolf island.

Meanwhile, the members of the expedition left at Teplitz bay were employed in taking observations, and making botanical and mineralogical collections. The meteorological records and observations of gravity and terrestrial magnetism will supplement those of Mr. Jackson at Cape Flora. Up to the present these observations have not been published, nor the hourly observations of the tide-gauge taken at the summer solstice and at the equinoxes. The auroral displays, so brilliant at

Cape Flora in the years 1894–97, were of small intensity; they were always of a whitish tint, and, beginning at the north-east, extended in the form of arcs and curtains towards the south-west.

Animal life was not abundant. The most common form was the polar bear, of which forty specimens were shot. Several of the birds already recorded in Franz Josef Land were observed. Ross's gull, hardly ever seen in Franz Josef Land, is also absent from Rudolf island, though occurring in large numbers on the neighbouring Hvidtland. Of plants thirty-nine species were collected, belonging to six genera of phanerogams and six of cryptogams.

The geology of the island, as far as can be judged from the brief remarks of the Duke of the Abruzzi to the Italian Geographical Society, is precisely similar to that of the more southern islands investigated by Dr. Koettlitz. There is the same basalt forming the mass of the island, and silicified wool was found near Cape Germania. A granite pebble on the same cape is an indication that the island was once submerged like the other islands; and a reindeer's horn at a height of more than 150 feet above sea-level and about 600 yards from the shore may, perhaps, have rested on a raised beach, as similar remains do on the coasts within the range of Dr. Koettlitz's examination.

It seems most probable, then, that the scientific results of this expedition other than geographical will simply confirm the conclusions previously arrived at, and render somewhat more complete our knowledge of the meteorology and magnetic variations in Franz Josef Land. The principal object of the expedition was to reach the pole or, at least, a higher latitude than had before been attained. In this it was successful, Captain Cagni having beaten even Nansen's record, and Italians are justly proud of their first achievement in arctic exploration.

DR. NANSEN'S SCIENTIFIC RESULTS.*

The two substantial volumes of the scientific results of the drift of the *Fram* and Dr. Nansen's adventurous journey over the ice, which have recently been published, give very full details of certain parts of the work, some aspects of which it may not be out of place to consider. We propose to refer specially to Prof. Geelmuyden's discussion of the astronomical observations, not only because of the able and thorough manner in which the author has handled his subject, but also because of the discrepancies between the positions fixed by observations, as finally calculated, from those provisionally accepted on the return of the expeditions. Our object is merely to

* 'The Norwegian North Polar Expedition, 1893–96.' Scientific results, edited by Fridtjof Nansen. Vols. i. and ii. Published by the Fridtjof Nansen Fund for the Advancement of Science. Christiania and London, 1900–1901.

place before those of our readers who may have been puzzled by the contradictory statements, a brief explanation which we trust will set the facts in their proper light. To begin with, we must deprecate the practice which has prevailed for many years of claiming credit for attaining a higher latitude than any predecessor, on account of a few minutes of arc in the calculated position. It is necessary to remember that a degree of accuracy which may be demanded in an examination or striven for in navigating a vessel in open water, is absolutely unattainable in polar regions, where the personal difficulties of observing in a very low temperature are combined with the unknown and unascertainable variations in refraction, the very low altitude of the sun, and the impossibility during the long polar day of seeing distinctly any other heavenly body.

In Dr. Nansen's case he out-distanced the best of his predecessors, not by miles, but by whole degrees of approach to the pole, and it is absurd to suppose, as some people actually appear to have done, that he attached any importance to the precise number of minutes by which he exceeded 86°. The great merit of his scientific work lies in quite another direction. It consists in the fact that by an exhaustive discussion of the observations of previous travellers he deduced the existence of a current or drift of water and ice across the north polar area, from the Siberian towards the Greenland coast, that he designed a practicable means of testing this theory, and that he proved it to be correct.

We question whether any practical traveller or geographer would find anything to excite surprise in the differences between the positions as first announced and as subsequently determined by the calculations of an experienced astronomer. The positions assigned to points of observation in the text and map of 'Farthest North,' and in other early publications, were only what they were expressly and repeatedly stated to be, of a provisional nature intended to give a rough general idea of the expedition, which would serve until more accurate computations became available. The public insisted on the very earliest information, and have no right to complain of the provisional nature of the first reports of scientific results. The complete discussion of the multifarious and complicated observations (astronomical, magnetic, meteorological, geological, oceanographical, etc.) could only be undertaken by specialists, whose labours would necessarily extend over many years, and, in fact, much of it is still uncompleted.

The discussion of the numerous astronomical observations has, however, now been finished under the supervision of Prof. Geelmuyden, and published in the second volume of the scientific results, with two new and excellent charts showing the routes of the *Fram* and those of Dr. Nansen and Lieut. Johansen. These final results, of course, differ from the preliminary and provisional values assigned in 'Farthest North,' and the differences are, as is not surprising, most conspicuous in the

results of the observations made for longitude during the first months of the sledge journey.

The provisional results had to be based chiefly on calculations made during the journey, with such rough corrections as appeared to be necessary after obtaining the correction of the watches (which had stopped on the journey) from Mr. Jackson at Cape Flora. There was no time after arriving at Cape Flora, still less immediately after returning home, to recalculate all the observations, and as a matter of fact Dr. Nansen was only able to compute some of the observations made in and near Franz Josef Land.

The result of Prof. Geelmuyden's work is to show the following facts:—

(1) The error in the assumed Greenwich time adopted after the regrettable stoppage of both Dr. Nansen's watches on April 13, 1895, is shown to be smaller than Dr. Nansen believed it to be on his return home. He estimated it in 'Farthest North' at 26 minutes (corresponding to 6° 30′ of longitude), while it now appears to have been only 15 minutes (corresponding to 3° 56′). This seems no very improbable mistake (deplorable as the occasion of it unquestionably was), as it means merely that, possibly on account of drifting of the ice, the travellers had been carried about 16 miles to the eastward of the position indicated by their carefully kept dead-reckoning.*

(2) The rate of Dr. Nansen's watch is shown to have been considerably greater than he assumed it to be from observations made before leaving the *Fram*. Thus the error in the assumed Greenwich time was always increasing during the month's journey, until it was as much as 29 minutes at the place where the winter hut was built, the position of which was fairly well determined by two different methods. The difference of the position worked out by Dr. Nansen in 1896 did not, we believe, differ by more than 2 miles from that determined by Mr. Armitage of the Jackson-Harmsworth expedition.

(3) A somewhat important result of Prof. Geelmuyden's discussion

* A few mistakes occur in the original longitudes calculated during the journey and quoted from the diary in 'Farthest North.' Thus on May 9, 1895, the longitude was given as 64° 20′ E., but it should have been 63° 24′ E., according to the correction for the watches assumed at the time, and Geelmuyden shows that the true longitude was probably about 67° 47′ E. On May 27, 1895, Dr. Nansen informs us that the longitude of 61° 27′ E. was given by a slip of the pen for 59° 7′ E., which it should have been with the assumed watch correction; Geelmuyden finds that the actual longitude was about 63° 52′ E. This is 30 miles east of the position where Payer placed his Petermann Land, which the Duke of the Abruzzi's expedition has now proved to be non-existent. In the maps published in 'Farthest North,' but not drawn by Dr. Nansen personally, there are several errors, such as placing the farthest north point in 90° E. instead of 95° E., the position which is repeatedly mentioned in the text, and which Prof. Geelmuyden has now shown was really 96° 30′ E. The text of 'Farthest North' contained several mistakes which did not occur in the Norwegian version, which must be looked upon as the authentic original of the book.

of the astronomical observations is, in his own words, that "there is another difficulty which for a certain period of the expedition is more serious than the stopping of the watches." This is that during April and May, 1895, nearly all the altitudes were measured with the sextant from the natural horizon. Two sets of observations made on April 2, 1895, one with an artificial, the other with the natural, horizon, seem upon closer examination to prove that in the special meteorological conditions (with temperature below $-22°$ Fahr.) the natural horizon was lifted perhaps 8′ or 9′, on account of irregular refraction, corresponding to a difference of nearly 10 minutes of time in the watch-error. This fact necessarily introduces considerable uncertainty into the determination of longitude, on the sledge journey in March, April, and May, 1895. It should serve as a warning to future arctic or antarctic explorers never to make use of the natural horizon when a theodolite or an artificial horizon can be employed. The sextant and natural horizon are, of course, the most convenient for use, and decidedly the least unpleasant at temperatures of from $-30°$ to $-40°$. Still, the additional trouble and even the risk of frost-bitten fingers should not be considered in the case where, as in those high latitudes, an error of 1′ of arc involves an error of 1 minute of time in the watch-rate. On the other hand, of course it must not be forgotten that in latitude 86° even an error of several degrees in longitude is comparatively unimportant, as 1° of longitude is equal to only 4 miles of distance, and even in 84° N. 1° of longitude does not exceed 6 miles. Thus the least accurate observations on Dr. Nansen's expedition were precisely those where the error corresponded to the least distance on the ground. The observations taken later on approaching Franz Josef Land were fairly accurate, as they were to some extent taken with the theodolite. As these observations supply data for controlling the error of the watches the latitudes and longitudes of the latter part of the sledge-journey may be looked upon as fairly accurate, as they are reproduced in the sketch-map of Franz Josef Land made at Cape Flora and published in 'Farthest North.'

It is pointed out that since the meteorological conditions on April 7, 1895, were almost the same as on April 2, it is probable that the latitude of the last meridian altitude taken towards the north should not be 86° 13′ N. (or 86° 12′·5, as Prof. Geelmuyden makes it), but only 86° 4′ N. As Dr. Nansen walked some distance northwards after the observation was taken, his extreme latitude may be placed at a minimum of 86° 5′ N. instead of 86° 14′ N.

We believe that Dr. Nansen most fully accepts all the corrections of his preliminary results, and we consider that he is to be congratulated on the manner in which Prof. Geelmuyden's searching criticism has established the substantial accuracy of what, though undoubtedly an important part of his work, is after all only subsidiary to the great objects he had in view.

DR. SVEN HEDIN IN THE LOB NOR REGION.

We are able to supplement the brief note given in our last number on Dr. Sven Hedin's operations during last winter from information received from the traveller himself. Writing from Chaklik, on the southern border of the Lob Nor region, on April 23, he states that after returning from the expedition described in the February number of the *Journal* (vol. xvii. p. 183), he undertook, in November last, a short excursion to the great or western Kum-kul, which he crossed and surveyed on three different lines. The districts passed through had previously been quite unknown. This expedition occupied only a month, and on December 12 Dr. Hedin was ready for a more extended journey, with a caravan of nine men, ten horses, and eleven camels. The route led first, by a somewhat difficult mountain road, to Khan-ambal, where the route followed by Littledale, lying further to the north, was touched for the first time. On Mr. Littledale's map the name appears as Nanambal. Beyond this Dr. Hedin appears to have still kept to the south of Littledale's route, making a circuit through the magnificent Anembar-ula range (partially explored by the Roborovsky expedition in 1894), which, according to existing maps, forms the link between the Astyn or Altyn Tag and the Nanshan. After returning to Khan-ambal he took a northerly route, crossing the desert to the mountain region which forms the easterly continuation of the Kurruk Tag. In the whole of this region Dr. Hedin was able to make many corrections of existing maps. During twelve long marches not a drop of water was found, and but for the lucky discovery of some snow on the third day the camels would have been unable to last out. By the help of the map constructed in March, 1900, Dr. Hedin easily found his way to Altimish bulak, whence a renewed visit was paid to the ruins on the north shore of the old Lob Nor.

At these ruins Dr. Hedin stayed a week, making plans and collections, taking photographs, and carrying out excavations. The most curious discovery was that of twelve Chinese letters in a complete state of preservation, with all the characters clearly legible, and of thirty small pieces of wood inscribed in Chinese characters with the name of the emperor, the year of his reign, the month, and even the day. They seem to have been of the nature of tickets. Some of them were read by a "Siah," who pronounced them to be eight hundred years old. A fine Buddhist temple was also discovered, with most artistic wood carvings. One of these showed a large fish, while fish bones, belonging to the same species now met with in the Kara-koshun, were found in a house. On one piece of wood of the size of half an octavo sheet of paper, Tibetan characters were found, while on one of the Chinese papers the place is called Lo-lan, mention being made of

the great road from Lo-lan to Sa-chu. A large collection of specimens and photos was made, and will form the basis of a most interesting study.

To the solution of the Lob Nor question Dr. Hedin has contributed further by carrying a level from the neighbourhood of the ruins to a point on the Kara-koshun. The result, he says, is fully to confirm his views. The starting point of the line was about 7½ feet above the level of the Kara-koshun, but immediately to the south of it was a depression (the old Lob Nor of Dr. Hedin) reaching about as much below that level. Between this hollow and Kara-koshun there is a protuberance of the desert soil, rising, according to a rough sketch given in the letter, somewhat above the level of the ruins north of the old lake-bed. Kara-koshun is, however, sending out an arm to the north in the direction of the latter, so that the protuberance above-mentioned is crossed by a north-to-south line of depression. The advance of the water was found to be so rapid that it was unsafe to camp on the lake-shores. Dr. Hedin says that the material he has collected on the Lob Nor region would in itself fill a volume.

As regards his future programme, Dr. Hedin proposed to stay some eight or ten days longer at Chaklik, and then to make a start on his final journey across Tibet. This he hopes to cross in a diagonal line from the Chimen-Tag to the sources of the Indus, passing, if possible, a little north of Lake Manasarowar. This journey will probably occupy almost the rest of this year. He would like to visit India from some point on the frontier, but will not return by sea, as he feels it incumbent on him to take back his Cossacks to some Russian town, Osh being mentioned as likely to suit best. It is, therefore, not until the spring of next year that we may hope to welcome Dr. Hedin back in Europe. If, as all wish may be the case, he returns safe and sound in about April next, his second great journey will have occupied no less than three years.

SHIP CANALS IN AUSTRIA.

The scheme for the construction of ship canals in Austria, which has come up from time to time during the last twenty-five years, has been given definite shape by an Act which became law on June 11 last. The following works have been authorized, the cost of each to be borne proportionally by the provinces immediately concerned: (1) A canal from the Danube to the Oder; (2) a canal from the Danube to the Moldau at Budweis, connected with the canalization of the Moldau from Budweis to Prague; (3) a canal from the Danube-Oder canal to the upper Elbe at Pardubitz, connected with the canalization of the Elbe from Jaroměř (above Pardubitz) to Melnik; (4) a connection of the Danube-Oder

canal with the system of the Vistula and with a navigable section of the Dniester. The preliminary work is to be finished by 1904, and the whole completed in twenty years' time. The main artery of the system is admittedly the Danube-Oder canal, the course of which is shown in the sketch-map. Its length is estimated at 170 miles, and it includes an ascent of 500 feet, and a descent (to Oderburg on the Austro-Prussian border) of 350 feet. The crossing of the watershed at the Mährische Pforte offers great difficulties, comparable with those of the proposed "Mittelland" canal in Germany; the channel has to rise more than 200 feet in a distance of about 1¾ mile. This is nevertheless the easiest possible course; and it passes through the rich and populous district of Eastern Moravia, and will connect the capital with the coal regions of

SHIP CANALS IN AUSTRIA.

Upper Silesia. On the Prussian side only the canalization of the Oder from Kosel to Oderburg is required to join it to the German and Netherlands systems, and to open continuous water-communication between the Black Sea and the North Sea and Baltic.

The connection of the Danube with the Elbe by help of the Moldau does not offer so good financial prospects. Here several alternative routes are proposed (see sketch-map), but whether it is decided to follow the central Vienna-Budweis line, or to take the upper Austrian course more directly in connection with the new railway on the Trieste system, the great granite barrier encircling Bohemia has to be crossed, requiring an ascent of some 1600 feet, comparable with that on the French Loire and Rhone canal through St. Etienne. These difficulties are encountered in a comparatively poor region, and the upper Moldau itself, with its many deep-cut windings, is but ill adapted for canalization. On the other hand, the completion of this part of the work would place Vienna and the Danube in direct connection with Hamburg, and

would open navigable routes from North sea and Baltic ports to Constantinople and Salina 1500 and 2000 miles shorter than the respective sea routes. The chance of the highland regions benefiting much by the through trade is modified by the fact that it could only go on for six or seven months in the year.

The third of the proposed canals seems to have better prospects. It leaves the Danube-Oder canal at Prerau (Northern Moravia), and crosses the relatively low pass of the Trübauer (1420 feet), already traversed by the railway from Vienna to Prague, to the Elbe at Pardubitz. The upper Elbe itself flows through a rich region, and, unlike the Moldau, has a wide valley through which a canal could go direct, avoiding the windings: the rise and fall in the whole length of 112 miles is less than 700 feet. The difficulties of establishing communication between the Danube-Oder canal and the Vistula and Dniester are even less formidable; the elevations range from 800 to 1000 feet above sea-level, and the rock material to be cut is soft. A canal 300 miles in length through Galicia would certainly be a great advantage to that province, but its general importance might not be so marked, because the Dniester, with its many windings, cut deep in the Podolian plain, will probably never make a good route for ships, and because it seems unlikely that the rivers flowing towards Russia can be made easily available for commerce through Galicia. The regulation of the rivers for purposes of navigation will necessarily go hand-in-hand with the construction of the canals, and this gives the whole project a further significance for the extra-Alpine regions of Austria. As Prof. Penck has pointed out, it amounts to the utilization of the water resources of the Alpine region. But the construction of the new Alpine lines already begun is destined to affect the commerce of the plains quite as much. This is especially true of the "Tauernbahn," 50 miles long, which taps a stretch of 150 miles without railways, east from the Brenner to Bad Gastein; and the "Karawanken-Wacheinerbahn," a southward extension of the former, 80 miles long, which gives Western Austria and South Germany communication with Trieste, by Innsbruck and Salzburg. This second line to Trieste—that from Vienna over the Semmering being the first—will be open for traffic in 1908.

ANCIENT TRADING CENTRES OF THE PERSIAN GULF.

By Captain A. W. STIFFE, R.I.M.

VII. BAHREIN.

An account of the antiquities of the Persian gulf is hardly complete without a reference to these islands. I have briefly referred to the prehistoric period in my paper, No. III., March, 1897, and to the tumuli,

etc., described by Captain Durand and Mr. Bent. Passing to Mohammedan times, there are the ruins on the great island of an early city, now chiefly mounds, with the ruins of a large mosque, with two tall minarets, of Shiah * origin, doubtless built by the Persians during their long occupation; but there is much to learn about these remains—personally, I had little time to give to them. The present towns are very similar to other Arab towns—houses mostly poor, the sheikh's residence being a high fortified building. The harbour is shallow, and not suitable for very large vessels. It is well known as a centre of the pearl-fishery from the earliest times, and a large carrying trade has been carried on in native craft owned here. A great fleet of pearl-boats belongs to the place.

The most remarkable feature of Bahrein is the existence of numerous fresh-water springs, both on the land, on the reefs below high water, and also under the sea. The origin of these springs has not been satisfactorily explained. The Arab notion, that they come from the Euphrates, may be dismissed. The Arabian shore, so far as can be seen, appears to be low and devoid of water, except at el-Katif, where similar springs are found. The possible solution is that the water comes from the Persian mountains, which would require the assumption of the existence of a synclinal basin under the gulf with an outcrop of water-bearing strata at this point. This was suggested to me by an eminent geologist, and I offer it as a probable solution. The head of water at the submarine springs is noticeable; the water will rise through a tube —a hollow bamboo is used by the natives—above the surface of the sea so that vessels may be filled.

The principal remains of the Portuguese occupation are those of the large fort, which is quite ruinous. There are the ruins of many large buildings within the walls. It has had a moat, embrasures in the parapet, and casemated embrasures in the re-entering angles of the bastions. It is typical of the Arab that the people know nothing about its origin, and questioned us on the subject. At el-Katif, on the mainland opposite the islands, is also an old fort of Portuguese origin.

Colonel Taylor, formerly Resident in the Persian gulf, says that in the sixteenth century the islands were subject to the Persians, until the early part of the eighteenth century. It was conquered and re-conquered by the Persians and Arab tribes. Nadir Shah appears to have held a firm grip of the islands, but after his death the sovereignty was held by various Arab chiefs from the settlements on the Persian coast until 1783, when it was taken by the el-Uttub Arabs, under whom it still remains. It is singular that Taylor does not give any information about the Portuguese occupation.

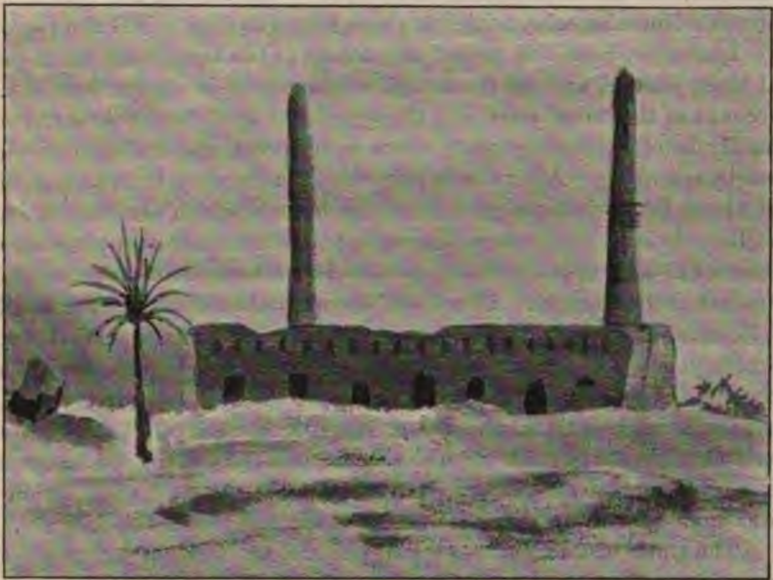
Abulfeda † mentions the island, and says it had 300 or more

* Sketch.

† 'Geographie d'Abulfeda,' trad. par M. Reinaud. Paris, 1848.

villages, and was two days' journey in length and breadth; vines, citrons, and palms abundant, with a great plain and pasturage—cultivated lands watered from springs. He also mentions the extreme heat and the pearl-fishery.

Shah Kodbodin (*sic*) of Hormuz, about 1320, reduced Bahrein and Katif, and subdued all the coasts of Arabia and Persia.* The account refers to Baharen, as "much talked of throughout the world, as well for the precious pearls found in its sea, as for the never-failing springs of fresh water that rise under it." Texeira says the Persians took it from Hormuz (*i.e.* the Portuguese) in 1602.



MOSQUE AT BAHREIN, OF PERSIAN ORIGIN.

In 1521, after the Portuguese had ruled Hormuz for about seven years, the King of Hormuz,† with 200 vessels and 3000 Arabs and Persians, and a Portuguese party of seven ships and 400 men under Antonio Corea, attacked Bahrein, which had refused to pay tribute for "Baharem and Catifa" to Hormuz, and consequently the tribute to the Portuguese was in arrear, and obtained a complete victory—"the island was restored to our Homager." The island was under "Mocrim, King of Lasah," and it seems the Portuguese did all the fighting. It is probable

* 'Lives of the Kings of Hormúz," by Torunxa, translated into Spanish by Texeira, now rendered into English by Captain John Stevens. London, 1715.

† 'Faria y Souza,' translated into English by Captain John Stevens. London, 1695.

the Portuguese forts were founded soon after this. Bahrein was one of the places that attempted to revolt against the Portuguese in 1522. In 1529 an attack was made on "Baharem," which had again revolted, but owing to sickness, and powder running short, the Portuguese had to abandon the siege.

In 1550 the Portuguese, with 1200 men in 19 vessels, assisted the King of Hormuz in an expedition against el-Katif, which was taken and blown up. The fort had been delivered up to the Turks by the people of el-Katif.

In 1560 the Turks sent an expedition from el-Basra to attack Bahrein, but the force had to surrender to the Portuguese under Don John de Noronha, who, with ten ships from Hormuz, raised the siege.

I have not been able to find any details of the loss by the Portuguese of these islands, and the occasional references to it do not agree. An account of the tribal wars, and the attacks of the Maskat Arabs, would hardly be of general interest; there is, however, one dramatic incident worth recording. After the expulsion of the Persians in 1783, a section of the el-Uttub tribe seceded from the branch which established itself at Bahrein, and established themselves at Khor Hassan, a place on the coast of al-Katr opposite the islands, and took to maritime war or piracy against their kinsmen. The Chief, named Rahmah-bin-Jaubír, and his followers, carried on their forays with varying success until 1826, in which year a determined engagement took place near Demmám. When the chief, then old and quite blind, found the day was utterly lost, he set fire to his magazine, and blew himself and crew into the air. It is said that his little grandson led the old pirate down to the magazine. The explosion destroyed also the vessel of the enemy with which he was engaged, and to which he grappled himself before the final act.

The Chief of Bahrein was a party to the treaties against piracy and maritime war, entered into by all the chiefs of the Arab littoral. His dominions are now virtually under British protectorate.

MR. MOLYNEUX'S MAP OF THE SEBUNGU DISTRICT, SOUTHERN RHODESIA.*

The map of the Sebungu district, lying to the south of the middle Zambezi, which will be found at the end of the present number of the *Journal*, has been compiled by Mr. A. J. C. Molyneux, a geologist in the service of the British South Africa Company, from surveys made by him during visits to the country between 1894 and 1900. Mr. Molyneux points out that it will correct existing maps, which have been incorrectly drawn, in various particulars. The most important error, which occurs, *e.g.*, in the map lately issued to accompany the report

* Map, p. 352.

on 'Mining in Rhodesia, 1900,' consists in the reduplication of the features of a large part of the Sebungu district, owing to the confusion of the Sengwe river, a large southern tributary of the Zambezi, with the Sinasenkwe, a much smaller stream which joins the main river higher up, and separates the Sebungu and Mafunga busi districts. Thus the Lutope, Golongolo, Gungwe, and Busse, which appear in Mr. Molyneux's map as feeders of the upper Sengwe, appeared again in the former map as Lopolo, Colongolo, Gunow, and Busse. The Sebungu river, which gives its name to the district, joins the Zambezi above, not below, the confluence of the Logola; while Mkoka's kraal, also misplaced and duplicated in some former maps, really lies in the Sengwe river coal area. The map is based on a compass survey, and adjusted to the positions of the mouths of the Sengwe, Bume and Sanyate rivers, as shown on Stanford's map of Rhodesia.

CENTRAL BORNEO.*

Fifteen years ago the centre of Borneo, whence the chief rivers of the island diverge towards all points of the compass, was an almost unknown country. The mountains, clothed with dense forest, are not easy of penetration, and the rivers are obstructed by numerous rapids. Added to this, the savage character of the Dyaks, who murdered Müller on the upper Kapuas in 1825, rendered a journey into their territory very dangerous, and even at the present day a visit to the upper Mahakam is not unattended with risk, though the influence of the Dutch Government and of the Sultan of Kutei has done much towards the suppression of head-hunting and tribal feuds. It is chiefly to the late Heer S. W. Tromp, Resident of the Western Division, that the scientific investigation of the centre of Borneo is due. He himself ascended the Mahakam in 1885, and the Kapuas in 1888, taking a steamer as far as the mouth of the Mendalam, 400 miles from the sea, and continuing his journey by boat up to Lunsa. It was at his initiative that the expedition for the geological examination of the upper Kapuas basin, described by Dr. Molengraaff, was equipped with the assistance of the Society for the physical exploration of the Dutch colonies. Dr. Molengraaff, accompanied by Messrs. Büttikofer, Hallier, and Nieuwenhuis, ascended the Kapuas in 1894, and examined the greater part of the basin of the upper Kapuas, then travelling down the Katingan to the south coast. In the fine work he has published he describes his journey in detail, and carefully records all his geographical and geological observations, with the exact positions in which the various rocks occur. Beside this, the exact spots where the rock specimens were collected are marked on the maps, together with the numbers of the specimens in the collection, which is now in the museum of the Utrecht University. Accordingly, future travellers will have no difficulty in connecting their observations with those of Dr. Molengraaff.

The upper Kapuas region above Sintang consists of two mountainous belts

* 'Geologische Verkenningstochten in Centraal-Borneo' (1893-94). Door G. A. F. Molengraaff. Met Atlas. Pp. 529 and Appendix, 3 maps, 56 full-page illustrations and numerous figures, etc., in the text, as well as 14 maps and sections in the atlas. 'In Centraal Borneo. Reis van Pontianak naar Samarinda.' Door Dr. A. W. Nieuwenhuis. 2 vols. Pp. 308 and 369. Leiden: E. J. Brill, 1900.

running east and west, and separated by the low plain of the river, which, towards the east, passes into hilly country gradually rising to the mountain chains. The upper Kapuas range on the north is composed of alternate strata of phyllitic clay-slate, sandstone, quartzite, and greywacke. This, Dr. Molengraaff's "old slate" formation, is most probably of Jurassic age, though no fossils have been found in it by which to determine the age, and is the oldest yet found in Central Borneo, with the exception of metamorphosed slates on the Samba river. Granite and other primitive rocks seem to be absent, and dykes of eruptive rocks are of rare occurrence. The Müller mountains on the south are volcanic, and probably date from the late Cretaceous or early Tertiary period. In the Kapuas plain very interesting rocks occur in what Dr. Molengraaff calls the Danau (lake) formation. It is a system of clay-slates, diabase, and diabase-tuff, in which are layers of jaspers and cherts containing numerous radiolarian casts. These were found over a considerable area north of the lakes, while to the south of the Semitau hills tuffs, marls, and limestones also contain Radiolaria. Dr. G. J. Hinde describes the Radiolaria, with plates, in an appendix to Dr. Molengraaff's work. The thickness of the beds is not easily determined, because the strata are much folded, but it cannot be less than 100 metres. Another formation in the Kapuas basin is a series of beds of sandstone, greywacke, arkose, and conglomerate, which is proved to be of Cretaceous age by the presence of shells of *Orbitolina concava*, Lam. The rocks and their distribution are described in a special chapter.

Dr. Molengraaff devotes a chapter to the geological structure of Central Borneo, and another to its geological history. On these subjects he particularly warns his readers in his preface that he cannot speak with certainty, as his researches were necessarily confined to a small portion of the area under consideration, and the knowledge of the geology of Borneo is still only fragmentary. His praiseworthy caution enhances the value of the few remarks he ventures to make. The crystalline schists, the metamorphosed sedimentary rocks of the Schwaner mountains, and the old slate formation he forbears to discuss, as scarcely anything is known of their relative age with regard to other formations, and he only expresses the opinion that the last was laid down not very far from the coast. In pre-Cretaceous times Central Borneo lay deep below the sea. On the bottom of this sea the skeletons of Radiolaria accumulated, and at the same time the material of the diabase-tuff was ejected by submarine eruptions, and perhaps volcanoes on islands in the ocean poured their ashes into the sea. When the movements began which raised the bottom of this deep sea above the surface of the water is uncertain, but certainly in the Cretaceous period (in the Cenomanian, the horizon of *Orbitolina concava*), a part of Central Borneo must have been dry land. At the time of elevation folding began, and alteration of the rocks by pressure, and at more than one place intrusion of granite took place. Towards the end of the Cretaceous period, the folding process seems to have ceased, and all Central Borneo, with the exception of the upper Kapuas range, was again plunged beneath the sea, and the sandstone was deposited over all the older formations. But comparatively soon a contrary movement set in, the land rising more to the south than the north, where, indeed, it may even have sunk a little. Thus the great fault was formed which now separates the northern range from the Kapuas basin, and the borderland became a main drainage line along which the Kapuas flowed westwards. In consequence of other minor dislocations, the Kapuas basin was sometimes dry and sometimes invaded by sea-water, and brackish-water formations were deposited. These invasions were not confined to the upper Kapuas basin, but the Melawi group is also due probably to an encroachment of the sea. During the long period when the system of parallel faults was formed, volcanic energy exhibited itself

along several of the fissures, resulting in the formation of mountains in an east-and-west direction. Meanwhile erosion also played its part in the modification of the surface, and recent formations of sandstone and shale, which do not differ from the older sandstone formation from which their material was derived, but contain thick seams of brown coal, were laid down, the rivers carrying down large quantities of vegetable matter and driftwood, as they do at the present day. After the disturbances of the crust which, beginning in very late Cretaceous times, continued perhaps to the very end of the Tertiary period, no important movements seem to have taken place, and the subsequent modifications of the surface have been due to atmospheric and water denudation, which has extended the coast-line both on the west and south, and is still at work, though with diminished intensity.

Dr. Nieuwenhuis accompanied Dr. Molengraaff, and with him crossed the watershed towards the Mahakam, where news of disturbances among the natives caused them to turn back. In 1896 he returned to Borneo, determined to make another attempt to cross Borneo from east to west, and, thanks in great measure to the acquaintance he had made with many of the Dyak tribes on his former journey, and the services he had rendered them as a medical man, he met with no great difficulty or danger. The account of his journey occupies less than half the book, a large number of chapters being devoted to the Dyak tribes, especially the Kayans, their clothing, religious beliefs, agriculture, methods of fishing and hunting, industries, tattooing, etc. Dyaks are the original inhabitants of the Kapuas basin above Bunut. The Tamans live on the Kapuas above Putus Sibau, on the Mendalam, Palin, and Embalu. Below Putus Sibau are the Kantuks, and Kayans on the Mendalam. To the Kantuks are related the Batang Lupers of the lake region. The Pnihings have migrated to the Mahakam, leaving only a few families in the Kapuas basin; it is uncertain whether they are related to the Tamans. Occasionally Punans and Bukats, wandering Dyak tribes, make their appearance at Putus Sibau. To this place a Dutch official was first sent in 1896. It is the highest point on the Kapuas to which steamboats can ascend when the water is not very low, and was long ago selected by the Malays as their most advanced post and a depôt for trade with the Dyaks, and for the collection of forest produce—rattans, gutta-percha, and indiarubber.

Much was, of course, known of the Dyaks and their customs long before Dr. Nieuwenhuis' journey, but his detailed description of all that relates to their mode of life and industries will be very acceptable to ethnologists, and his illustrations of their tattoo patterns, carved sword-handles, pottery, and other utensils are numerous and interesting. Head-hunting seems to be no longer in vogue, as connected with religious customs, except among the wandering Bukats and Punans.

A map of the Mahakam valley ought to have accompanied the work.

REVIEWS.

AFRICA.*

WYLDE'S 'MODERN ABYSSINIA.'

AMONGST the few permanently valuable books that have recently appeared on African subjects, a prominent place must be assigned to Mr. Wylde's 'Modern Abyssinia.'† It is by no means a systematic treatise; indeed, the author would

* By Prof. A. H. Keane.

† 'Modern Abyssinia.' By Augustus B. Wylde, late Vice-Consul for Red Sea. 506 pp. Methuen, 1901.

almost seem to have a natural aversion from system of any kind, whether in the arrangement and treatment of the subject-matter or in composition, and especially the spelling of geographical and personal names, of which it may be truly said that *sine lege vagantur*. But beneath these surface blemishes, for which the publishers should be held at least partly responsible, there remains a great body of information valuable alike to the geographer, the naturalist, the student of sociology, and the statesman. An almost continuous residence of over a quarter of a century in Ethiopia and the adjacent lands, where he has played many parts and done useful work in his official capacity and as newspaper correspondent, has afforded the author every opportunity of acquiring a thorough knowledge of the country and its inhabitants. This knowledge is communicated in an attractive straightforward manner, which, despite some startling solecisms, disarms criticism, and may be accepted as trustworthy in all cases where the writer speaks at first hand or from personal observation. Some introductory and historical matter, confined mainly to the last thirty years, is followed by a useful chapter on the more salient geographical features of the land, and more particularly the drainage areas, to which special attention is paid. But this general survey fails to give a complete picture of the rugged Ethiopian plateau, because Mr. Wylde describes only those districts which he has himself visited, and his itineraries were, as he tells us, always confined to "the eastern half of Abyssinia."

This, however, is to be the less regretted since the main outlines of the whole region are fairly well known from other sources, while the detailed accounts of the less frequented eastern provinces, with which most of the remaining chapters are occupied, will be doubly welcome to students of the Ethiopian uplands. Many of such details will be received with surprise by most readers, and are of such a nature as to profoundly modify current views regarding the steppe-like and generally unproductive character of Tigré, Waag, Lasta, Yejju, Wollo, and some other eastern districts. It was in 1896, after the crushing defeat of the Italians at Adowa, on which some curious light is thrown, that these provinces were visited, the route running first in a general southern direction from Massawa and Asmara, across the Mareb river to Adowa and Abbi-Addi, and then across the western affluents of the Tacazze and Abai by the great market of Socota in Waag, and thence through the territory of the Wollo Gallas to Adis-Ababa in Shoa, present capital of Menelik's empire. From this point the journey was continued to Aden by the now familiar road through Harrar to the coast at Berbera. Here, of course, there was little new to report, and the main interest of the volume centres in the sections dealing with the eastern tracts, their rich sub-tropical vegetation, great natural resources, and the social relations of their Abyssinian and Galla inhabitants.

Many parts of Waag are described as "splendidly cultivated," yielding heavy crops of cereals, ample both for the local supply and for export to less favoured districts. Yejju also produces "everything that man wants in this world—tobacco of excellent quality, bananas, limes, oranges, cotton, coffee, sugar-cane, potatoes, vegetables of all sorts, red pepper, onions, garlic, wheat, barley, Indian corn, dhurra, tef and other grains, beans, peas, shipti plant for soap, plenty of milk and butter, oxen, sheep, chickens, and everything in abundance, and at absurdly cheap prices, also the most delicious white honey, for which the district is famed." The people also, both Christians and Mohammedans, are far more civilized than is commonly supposed, living in good well-thatched stone houses, growing, weaving, and dyeing their own cotton, tanning the hides and skins of their live stock, smelting their own iron and working it into spears, swords, knives, and agricultural implements. The charge of eating raw steaks from the live animal, a charge dating from the time of Bruce, is effectually disposed of once for all, and the peasantry are declared to be

neither thieves nor brigands, but friendly to strangers if properly treated, so that travellers complaining of being molested have no one to blame but themselves. Beyond a good engraving of Menelik, there are no illustrations, and the index is far too meagre. But the accompanying map shows for the first time the correct course of the Wanchit and Adabai tributaries of the Blue Nile, besides some rectifications of the Italian surveys of the water-partings between the Tacazze, Abai, and Hawash drainage areas. It should be mentioned that there are chapters on sport and big game, and several appendices with copious lists of the Abyssinian fauna, rainfall records, texts of international treaties, and other useful matter. Altogether the book is so valuable that the publishers would be well advised to issue a revised edition, in which some order might be introduced into the chaotic spelling, with such exuberant variety as Adis Abbaba, Adese Ababa, Adie Abbaba; Tajurrah, Tadjurah, and (on map) Tajurra; Ras Makinnan and Ras Makunan (in official documents); Negoosa and Negusa, and so on. A delightful account of bird-life is somewhat marred by the misleading statement that "Abyssinia possesses no humming-birds" (p. 493), being in this respect no exception to the rest of the Eastern Hemisphere.

Bonchamps Mission.

So much attention was absorbed by the Fashoda incident that little heed was paid to the Bonchamps Mission, which was all the time co-operating from the Abyssinian side with Commandant Marchand, advancing to the Nile from the west. Indeed, no detailed account of its movements has yet appeared in an English form, and as it traversed some new ground in the upper Sobat basin, geographers will be glad to have the very full and graphic description of the route by M. Michel in the 'Mission de Bonchamps.'* On the political aspect of the question, which has now merely an historical interest, it will suffice to remark that the author speaks with an almost cynical frankness, avowing that the two missions were planned as "the French dream from the Atlantic to the Red Sea in opposition to the English dream from the Cape to Cairo." It is generally supposed that the mission actually reached the Nile a short time before Marchand made his appearance at Fashoda. But it was not so, and M. Michel explains that the expedition got no farther than Nianiam, at the head of the Sobat river proper, in the Abigar (Nuer) territory, whence it had to retrace its steps through Buré and Goré to Adis Ababa, where it was broken up in April, 1898, about a year after setting out from Jibutil on its adventurous enterprise. Nevertheless, two members of the mission, MM. Faivre and Potter, with the Russian Colonel Artamanoff, did reach the Nile at the Sobat confluence on June 22, 1898, but in the suite of an Abyssinian force under the Dejaz-Mach, Tessama-Nado. Here were hoisted the Ethiopian flag on the right and the French on the left bank of the main stream, and it was these flags that were saluted by Marchand on July 9 on his way down the Nile to Fashoda. Of this bold attempt to create a French or Franco-Abyssinian zone across the continent nothing now remains except the valuable geographical discoveries which were made by the de Bonchamps and Tessama-Nado expeditions, and a graphic account of which will be found in M. Michel's book. The main result was the accurate determination of the greater part of the upper Sobat basin, which comprises most of the region between 6°–10° N. and 33°–36° E. On the

* Mission de Bonchamps, 'Vers Fachoda à la Rencontre de la Mission Marchand à travers L'Ethiopie.' Par Charles Michel, Second de la Mission. 554 pp. Paris: Librairie Plon (no date).

accompanying map are clearly shown the lower courses of the Birbir and Baro, which meet at Damabo just below the western scarp of the Ethiopian plateau to form the chief northern branch of the upper Sobat. The Ajubba, which was followed by the Abyssinian expedition from its source on the Suro uplands, forms the southern branch, the confluence at Nianiam being only a short distance above the well-known Anglo-Egyptian station of Nasser, on the Sobat proper. The total length of the lower Sobat between the junction of the two forks and the Nile is stated to be about 160 miles (263 kilometres), and the distance from the Nile to the Ethiopian foothills by the Sobat-Baro route about 350 miles (569 kilometres). All distances from Jibutil to the Nile by both routes, together with altitudes, daily meteorological records, and other valuable data, are given in carefully prepared tables, which occupy no less than twenty-two pages, and go far to fill up the hitherto blank spaces on the map of Southern Ethiopia. It may be mentioned that the Garafanda heights about the headwaters of the Ajabba and not far from the Omo basin are here renamed Mount Maurice Potter, in memory of the artist of the expedition, who died in this district during the return journey from the Nile. His name will also live in the numerous excellent illustrations with which M. Michel's volume is enriched.

Somaliland and the Comoros.

In 1900 M. Heudebert, whose name has for some time been associated with French colonial enterprise, made an excursion to the east coast of Africa, the results of which are recorded in a volume * sparkling with *esprit* and much shrewd observation of men and the lands visited. These ranged from the Suez Canal to the Mozambique channel, although the author is naturally interested mainly in the French settlements on the eastern seaboard. Hence the greater part of the book is occupied with the development of French activities from Obok round the head of Tajurra bay to Jibutil and thence inland to Harrar and Abyssinia. Indeed, so much space is given to the personal action of M. Lagarde and his successor M. Alfred Martineau, that his remarks seem largely inspired by these able and energetic administrators of the French Somali Coast possessions. In any case, the general reader will here find just the information which is so much needed, and is so difficult to obtain in English books, regarding the steady expansion of French enterprise in the region about the head of the Gulf of Aden. The story of the gradual eclipse of Obok by Jibutil is very well told, and many will read with astonishment that the latter place, with its fine harbour and railway already advancing towards Harrar and Shoa, is destined to become the future outlet for the trade, not only of Abyssinia, but also of a great part of the Somali and Galla lands. In a region which has in recent years been overrun by travellers, traders, sportsmen, and adventurers, our author found no opportunity of making any gleanings in the field of geography. But the ethnologist will here find an excellent account of the Danakils (Afars), who form a distinct and important branch of the eastern Hamites between the Abyssinian plateau and the Red sea, but about whom little information is available, except from Italian sources and the writings of Munzinger, Almqvist, and other specialists. Apart from the inevitable mangling of English names, the book is well printed, but, strange to say, has no maps, no index, or table of contents.

* Lucien Heudebert, 'Au Pays des Somalis et des Comoriens." 281 pp. Paris: Librairie Orientale et Americaine, 1901.

Fuller's 'Egypt and the Hinterland.'

Mr. F. W. Fuller has embodied in a bulky volume * a considerable amount of material collected by him during repeated visits paid to Egypt before and since the British occupation. There is a great deal of discursive matter on Mohammedan traditions, early history, persecutions, the Napoleonic episode, magic and witchcraft, with some other irrelevant topics, which look like padding. But enough solid information remains to justify the author's claim that the book may be regarded as a useful supplement and continuation of such standard works as Sir Alfred Milner's 'England in Egypt,' Mr. Silva White's 'Expansion of Egypt,' and Mr. W. Spencer Churchill's 'River War,' bringing events down to the close of the nineteenth century. Students of Church history will be attracted by the sections devoted to the Coptic Christians and their peculiar rites. But perhaps the most valuable part of the volume is that which is occupied with the present social conditions in the Nile valley—finance, the peasantry, mixed and national tribunals, administration of justice, land tenure, and the great drainage and irrigation works now in progress at Assuan and Assiut. "The fact is," writes Mr. Fuller, "that, as we stand upon the threshold of a new century, we are looking wistfully into an era of promise to Egypt in matters regarding water and justice which has never been dreamed of as possible—a complete water-supply, and a tangible system of justice all round, simplified by a complete revision of the whole Penal and Criminal Procedure Codes." Mr. Stanford supplies one of his useful large-scale maps, in which are clearly shown the respective spheres of the conterminous Anglo-Egyptian, French, Abyssinian, and Italian possessions, so far as determined by the latest international agreements. Unfortunately, no attempt has been made to conform the spelling of geographical names with that of the text, so that the usual discrepancies—Assiut and Siout, Assuan and Assouan, Massowa and Massawa, Fayum and Fayoom, Sudan and Soudan, etc.—still abound. But it is hopeless to look for consistency in these matters until some enterprising publisher undertakes the preparation of an authoritative geographical nomenclature.

The Fayum.

The volume of the Græco-Roman branch of the Egypt Exploration Fund, dealing with the recent discoveries of old documents in the Fayum,† contains much matter of quite exceptional interest, not only to students of palæography, but also to geographers and the general reader. It covers the two periods 1895–96 and 1898–99, and gives an exhaustive record of the excavations conducted by Messrs. Hogarth, Grenfell, and Hunt during those years in various parts of the Fayum depression. The general plan of publication is that adopted in previous volumes, the literary texts being printed as written except for the division of words, while the non-literary texts are reproduced in modern form with accents, breathings, and punctuation. A complete list of all the recovered documents, both papyri and ostraca (inscribed potsherds), is followed by a luminous treatise on the ancient geography of the Fayum, in which a laudable caution is displayed in the attempt to identify modern villages and other sites with those mentioned by the writers of

* 'Egypt and the Hinterland.' By Frederic Walter Fuller. Pp. xv. + 333. Longmans. 1901.

† 'Fayûm Towns and their Papyri.' By B. P. Grenfell, A. S. Hunt, and D. G. Hogarth, with a chapter by J. Grafton Milne. Pp. xvi. + 374. Offices of the Fund, 37, Great Russell Street, London.

Ptolemaic and Roman times. That the present Fayum was the Arsinoite nome (district) of antiquity there was never any serious doubt, and that the great Lake Mœris is still represented by the shrunken Birket el Karun had already been clearly shown by Major R. H. Brown, whose general views have been so far confirmed by the present excavations. Here it is now explained how the famous reservoir was finally transformed to a flourishing and populous province with a reduced lake at its lowest level. Amongst other topographical points that may be regarded as fairly established are the modern Senuris = Psenuris, Kom el Faris = Crocodilopolis, Rubayyat = Philadelphia, Wadfa = Philoteris, Haret = Theadelphia, Umm el Bagarat = Teptunis, Umm el 'Atl = Bacchias, and some others more doubtfully, as indicated on the accompanying map of the nome. The reputation of Herodotus, so severely handled by Sayce and Mahaffy, is restored; his description of the province is declared to be "much more valuable than that of Strabo," and we are told that his general account of the Fayum is mainly confirmed by the evidence of archæology. Another important conclusion is that Lake Mœris can hardly, if at all, have been above sea-level after 200 B.C., when it was consequently not more than twice its present size. In Græco-Roman times, the area under cultivation was not much smaller than at present, since on the east side the old Bahr Wardan, which branched from the Bahr Yusuf south of Hawara, enclosed a large productive area which subsequently became desert. This will explain the statement of Strabo, that in his time "this nome is the most noted of all, both in aspect, fertility, and buildings." Of the papyri here published, a few facsimile specimens of which are given, the great majority consist of legal and official documents, petitions, farm and military accounts, tax and bankers' receipts, orders on payments, notices of deaths and private correspondence, some quite in the modern style. Thus a daughter to her mother: "Please give the share that falls to you of the fruit of the vineyard to your sister, and a bunch of grapes. I have sent you three pairs of bowls, and a little cup for little Thernas, and another for the daughter of your sister." More important are several fragments from Homer, Demosthenes, and Euclid, and quite a long passage from Chariton's historical romance, 'Chæreas and Callirrhoe,' already known from a Florentine manuscript. The general editing is above criticism, and the volume is enriched by no less than eighteen full-page plates of archæological and other illustrations.

Foà's Journey across Africa.

M. Foà (whose premature death is to be regretted) is to be thanked for a very clear and not too verbose account of his plucky journey across the continent, undertaken at the instance of the Minister of Public Instruction in 1894–97.* Such a journey, as he reminds us in the introduction, is no longer any great exploit in itself, especially if the traveller be furnished with unlimited credit, and lingers nowhere long enough to contract any local disorder. But it is another matter "when it has to be accomplished on foot, as was my intention, accompanied by a handful of trustworthy men, with relatively little money, sojourning everywhere, everywhere collecting materials profitable to geography, ethnology, natural history, the sciences in general, trade, the industries, and colonization." This is undoubtedly what M. Foà has done, although the more valuable results are not embodied in the present volume. So much time was given to sport that he has dealt with the subject in a special work ('Chasses aux Grands Fauves dans l'Afrique Centrale,'

* 'La Traversée de l'Afrique du Zambèze au Congo Français.' Par Edouard Foà. Pp. xii. + 323. Paris: Plon, 1900.

Paris, 1900). The scientific results also proved so important, that they have been reserved for a third volume, comprising his numerous astronomic, magnetic, climatologic, and meteorologic observations, together with a considerable mass of topographic, biological, anthropologic, and technical details. Little therefore remained for the work under notice, except an account of the route followed and of the incidents of travel, much of which has already been reported in the pages of this *Journal*, and need not here be repeated. It may be noticed that the explorer has been awarded the grand gold medal of the Paris Geographical Society, and that, if the *format* of the book is scarcely worthy of the subject, he has at least enriched it with forty-four full-page engravings, all from photographs taken by himself along the route. There is also a good-sized map which covers the whole field surveyed, and has been specially constructed from the author's itineraries and astronomic observations. It has the further merit of showing by distinctive red lines those sections of the route where new ground was broken. It may be added that this new ground lay almost entirely between the west coast of Lake Tanganyika and the right bank of the Congo above Nyangwe. In an appendix are collected some useful data on the economic and industrial development of the regions traversed.

Moore's 'Mountains of the Moon.'

Under an unnecessarily sensational title,* Mr. Moore has issued an excellent account of the regions traversed by the Tanganyika Expedition of 1899–1900. By 'Mountains of the Moon,' a title already usurped by Mrs. Pringle, he simply means the Ruwenzori range near the northern terminus of the expedition which he conducted with such signal success from the Zambezi delta along the Great Rift Valley (Dr. Gregory's Rift Valley), through the Nyasa-Tanganyika lands to the equatorial lakes, and thence to the coast at Mombasa. The great mass of the rich scientific harvest garnered by the way is reserved for treatment elsewhere. But enough remains to give tone to the present volume, and raise it far above the category of ordinary books of travel. Mr. Moore looks at his milieu with an unerring scientific eye, and is thus able to deal with several geological and biological subjects of great interest in a highly instructive manner. Such is the strange park-like aspect of so many parts of inter-tropical Africa, a feature which here finds an explanation as simple as it is beautiful. The apparently artificial character of the landscape is everywhere due to the euphorbia trees springing up on the bare sandy soil of old lacustrine beds, where nothing else will grow at first. Then other plants, thorns, climbers, and flowering shrubs, gather beneath the grateful shade of the euphorbias, gradually wax stronger, and at last strangle their foster-mother, themselves blending together in leafy clumps dotted over the long alluvial slopes, but still expanding, and some day merging in continuous forest growths. In this delightful way are discussed other problems, such as the reported oscillations in the level of Tanganyika, and the Jurassic marine fauna still surviving in that now freshwater basin. Highly informing is also the account of the Lake Kivu volcanic region, with its still active cones standing at a greater distance from the seaboard than any other on the surface of the globe. Here Speke's Mfumbiro is restored to its place of honour, if not as the name of a particular mountain, at least as the name of a district in which several fiery giants develop a great barrier between Kivu and Albert Edward. Hence "Mr. Grogan is quite wrong when he goes out of his way to point out that the Mfumbiro

* 'To the Mountains of the Moon.' By J. E. S. Moore. Pp. xvi. × 350. Hurst & Blackett. 1901.

mountains only exist in the minds of English statesmen. . . . The data in his map published by the Royal Geographical Society, where it differs from that of Count Götzen, differs also equally from the observations made by Fergusson during the present expedition; for these observations entirely confirm and merely extend the observations made by Götzen himself." It need only be added that the accompanying large-scale map is based on these very observations made by Mr. Fergusson, surveyor to the expedition. Several of the illustrations, which complete the equipment of this handsome volume, are from sketches by the gifted author. On the more general question of the African continent as a permanent field for European enterprise and settlement, Mr. Moore strikes a deep pessimistic note. "Nowhere," he writes, "on this vast interior, along any of the thousands of miles of route over which I have travelled, have I ever come across any places at all comparable to the very worst districts in New Zealand or the Far West of America. When low, the country is enervating, fever-stricken, and hot; when high, wild, changeable, and wet. Can any one who has been in Equatorial Africa name a single place anywhere where he would like to go and live, and where he thinks he could make farming pay in any other sense than that of providing him with food stuffs until he died of fever?"

Bentley's 'Pioneering on the Congo.'

Although occupied mainly with the progress of missionary work in the interior, the Rev. M. Bentley's two profusely illustrated volumes* contain much matter of interest to the general reader, and even to the student of geography. Indeed, the well-known author of 'Life on the Congo' and of the standard 'Dictionary and Grammar of the Kongo Language'—one of the best contributions yet made to the study of Bantu philology—could scarcely write on any Central African topic without being instructive. Without entering into details, with which most geographers are already familiar, it will suffice to say that they will here find a clear summary of recent geographical, political, and social development conveniently arranged for purposes of general reference. Attention may be drawn especially to the chapters on "The Old Slaving Days," "The Congo Basin and its Inhabitants," "Exploration of the Upper River," and "The Government of the Congo Free State," although in the last-mentioned the methods adopted by some of the Belgian officials in developing the resources of the country are treated perhaps with too light a hand. Most of the illustrations are from original sources, and the large map comprising the whole of the intertropical region between 5° N and 19° S. shows with praiseworthy impartiality all the present and abandon stations of the Protestant and Roman Catholic missions.

Senegal.

To an invitation from the management of the Paris Exhibition of 1900 to report on the biological and geological relations in Senegal, a number of French savants have responded with a compact little volume,† in which they have contrived to communicate a considerable mass of well-digested information on the ethnology, botany, zoology, and physical characters of that region. Naturally there was not much fresh matter to be gleaned from such a well-known and well-

* 'Pioneering on the Congo.' By the Rev. W. Holman Bentley. 2 vols., with map and 206 illustrations. The Religious Tract Society, Paternoster Row. 1900.

† 'Une Mission au Sénégal: Ethnographie, Botanique, Zoologie, Geologie.' Par MM. Dr. Lasnet, A. Cligny, A. Chevalier, P. Rambaud. 348 pp. Paris, 1900.

administered colony, and the chief value of the book consists in its clear and systematic treatment of the multifarious contents. More than half the volume is devoted to the races of Senegal, whom Dr. Lasnet classes under three main divisions: *Semites*, including "Moors" (Arabs and Berbers), and Fulahs; *Negroes*, comprising several branches of the widespread Mandingan family, with Wolofs, Serers, and other aborigines; *Half-breeds*, such as the Toucouleurs, Fulah and Wolof cross, and the Khassonke's (Fulahs and Mandingans). Here the faulty terminology might be amended by substituting *Caucasians* for *Semites*, a term quite inapplicable to the Berbers and Fulahs. The history, usages, and social institutions of the several races are described at some length; their geographical distribution is shown by a carefully prepared ethnological map, and the various types are well illustrated by a series of excellent reproductions from photographs.

THE BERBERS.

In the spring of 1900 Mr. Randall-Maciver and the late Mr. A. Wilkin, acting on the suggestion of Mr. Flinders Petrie, with whom they had been working in Upper Egypt, paid a visit to the Kabyles and Shawíya Berbers of Algeria, their object being to trace, if possible, the connection of these aborigines "with the most ancient races of Egypt by the methods of anthropology, by collections of pottery, of designs, of physical measurements, and by observation of their every-day occupations, and of the monuments of their ancestors." The results of the expedition are embodied in two works of very different character—one by Mr. Wilkin * covering the incidents of the journey, and seasoned, so to say, with a dash of science; the other, by both investigators,† dealing exclusively with the scientific and technical sides of the subject. The first, which is written in the bright, readable style suitable to a popular record, need not detain us, since it moves in familiar ground where the "incidents" fall necessarily short of the sensational, while the serious element inevitably recurs in the second book. Here the outcome was disappointing for the explorers, and it may be added that had they possessed a more ample knowledge of the ethnical relations, they might perhaps have given up the expedition, or else conducted it on somewhat different lines. How little their ethnological lore is abreast of the times may be inferred from the fact that they seem to be entirely unaware of the new theories advanced by Sergi and myself on the primordial relations of the Mediterranean peoples, a subject indispensable to the present inquiry. The Shawíyas, also, and the Kabyles, the two Berber groups visited by them, are unaccountably equated with the Zauēkes and Kabales of Herodotus, the fact being that both of the former terms are of comparatively recent (Arab) origin, and only adopted by these Hamites under protest. Shawíya, meaning "shepherds," is written in the French fashion, *Chaouía* throughout, and we are told to pronounce it *Sharweeu*, with an intrusive cockney *r*. After a close study of the Egyptian and Berber potteries and the measurement of a great many Shawíya and Kabyle heads, the general conclusion arrived at was that it was "impossible any longer to maintain the view that the prehistoric Egyptians were Libyans," but that the resemblance of the earthenware and of the character and details of the decorative art point at a very intimate relation between Libya and Egypt in prehistoric times. The reference to Prof. Erman is unfortunate, because that philologist is entirely astray respecting the Semitic affinities

* 'Among the Berbers of Algeria.' By Anthony Wilkin. Pp. xiv. + 263. Fisher Unwin. 1900.

† 'Libyan Notes.' By David Randall-Maciver and Anthony Wilkin. Pp. viii. + 113, 4to. Macmillan. 1901.

of the Egyptian language. There is a great parade of tables, diagrams, and craniometrical measurements, which, if they prove nothing, the fundamental nature of the problem being misunderstood, will be none the less acceptable to students of racial characters.

African Rubber.

Owing to various causes, but chiefly to the ever-increasing demand of the home market and the primitive methods of exploitation in use amongst the natives, the supply of rubber from the German West African possessions has greatly fallen off in recent years. To remedy the evil and place the industry on a sound footing, a mission was organized in 1898, under the auspices of the "Colonial Economic Committee," with instructions to study the question on the spot, and especially to explore other parts of the interior in quest of such caoutchouc-yielding plants as might be found most suitable for cultivation in the Kamerun and Togo territories. Herr R. Schlechter, who was appointed leader of the expedition, gives what may be taken as an official report on the results in a handsome volume,* enriched with a considerable number of full-page and inset illustrations, chiefly botanical (landolphias, kickxias, and other rubber-bearing species), but with neither maps nor index, and a very jejune table of contents. *En ravanche* students of economic growths will here find a very full descriptive table in Latin of useful African plants, which occupies no less than sixty pages, and is arranged both in respect of families and genera according to the system proposed by Dr. A. Engler. The regions visited were the Congo basin, the Sanga-Ngoko districts, and the hitherto unsurveyed parts of the Kamerun and Togoland, and the committee certifies that its mission "has fulfilled its object and obtained practical results, especially by the introduction of rubber-culture in a large way on the Kamerun plantations."

Kamerun.

It would require several pages of the *Journal* to give an adequate notice of Herr Dominik's somewhat formidable volume,† which, although covering a period of only six years (1894–1900), may claim to be one of the most instructive of recent contributions to the development of European culture in tropical Africa. As a soldier, the author has little to say on strictly scientific or technical matters. But his military duties brought him into daily contact with all classes of the community—officials, traders, planters, missionaries, and natives—in every part of the Kamerun and its extensive hinterland, and these brightly written pages show what excellent use he has made of his varied opportunities. Much space is naturally given to the numerous military expeditions in which he took part, and by which the colony has gradually broadened its confines in the direction of Adamawa. But the author had also an eye for the social and economic relations, and in these respects he is able to speak of a marked improvement in the condition of the natives. Here also the absence of an index is much to be regretted. But there is a good map of the Kamerun district, and the book will also be valued for its numerous illustrations, many of which are choice specimens of the German engraver's art.

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* 'Westafrikanische Kautschuk-Expedition (R. Schlechler), 1899–1900.' Pp. viii. + 326. Berlin: Verlag des Kolonial-Wirtschaftlichen Komitees, 1900.

† 'Kamerun, Sechs Kriegs- und Friedensjahre in deutschen Tropen.' Von Hans Dominik. Pp. viii. + 315. Mittler & Sohn, Berlin. 1901.

THE MONTHLY RECORD.

EUROPE.

Ice during Summer in the Auvergne Mountains.—A note by M. P. Glangeaud appears in the *Comptes Rendus* (July 15, 1901), on the subject of ice-formation during summer among the extinct volcanoes of Auvergne. The ice is found in certain funnel-shaped depressions, resembling miniature craters, with which the surface of the great lava-flow (Labradorite) of the volcano of Côme is broken. The formation of the ice is accounted for by the writer thus: The rocks of this volcanic region, the most difficult of access of all Auvergne, are generally of a porous nature, and, resting on the original floor of the valleys over which the water now follows an underground course, absorb large quantities of water, which is brought to the surface where the lava sheet is thin. Under the influence of the solar heat an intense evaporation is produced, which reduces the temperature to such a degree that ice is formed. This explanation is supported by the fact that it is just in the hottest time of the year, when the shade temperature reaches 93°, that the ice-formation has been noticed. Only one ice-hole is generally known—that near Pontgibaud called by the country people the "Trou de la glace," but similar localities are to be found elsewhere, as, *e.g.*, in the basaltic lava-streams of Aydat, which had their origin in the volcanoes of La Vache and Lassolas.

Scientific Investigation of the Murman Sea.—A Russian expedition, under the leadership of M. N. Knipovich, visited the Murman sea in the years 1898, 1899, and 1900, for the purpose of inquiring into the hydrological and biological conditions, chiefly in connection with the fisheries. Amongst the fishes caught were several not hitherto reported from the Murman sea. Such were the semi-transparent *Cyclogaster gelatinosus*, various species of Lycodes, Lumpenus, etc.; also *Platysomatichthys hippoglossoides* and the blue wolf-fish (*Anarrhichas latifrons*). A very unexpected catch was a large tunny, more than 6½ feet long, a form never seen before north of the Lofoten islands. Another rare species was *Paralepis borealis*, never found before on the Murman coast, or even in European seas. A specimen of *Nemalycodes grigorievi* was also procured, the third hitherto known, and *Raja fyllæ*, known before only on the American coast. The large shrimp *Pandalus borealis* was found in large numbers, both in the inner parts of the Kola and Motovski bays and in the open sea. Not a single specimen had been caught before, except in the Varanger fiord. It is associated with a special fauna of molluscs, fishes, Pantopoda, Crustacea, and Echinodermata, which constitutes the chief food of the more important marketable fishes. A large quantity of invertebrates were brought up by the trawl. Sometimes tens or even hundreds were captured in a single haul of species which had never before been met with in the Murman sea, or very seldom. The trawl occasionally contained, among other organisms, large numbers of *Gorgonocephalus*, or large *Antedon*, *Psolus*, *Trochostoma*, *Myriotrochus rinkii*, species of *Neptunea*, *Ukko*, *Buccinum*, etc. *Asterias stellionura* and *panopla*, *Schizaster fragilis*, etc., were abundant. Marketable fishes proved to be more widely distributed than was expected. Cod, *Sebastes norvegicus*, and *Drepanopsetta platessoides* were found from Bear island almost to the coast of Novaya Zemlya, and from the Murman coast up to lat. 75° N. The blue wolf-fish, considered to be a Finland species, was caught not far from Novaya Zemlya, among other places. With the marketable fishes was associated a typical arctic fauna, both of fishes and invertebrates, which was observed on the banks of the Kanin peninsula and further east, in the direction of Novaya Zemlya. Cod occur in very low temperatures, 28½° Fahr. for instance, and in water only a little warmer, about 34° Fahr., all the chief Murman fish were caught. Very successful

hauls were made in the end of May on the Kildina bank; in Motovski bay at the end of June; and on the Teriberka bank at the end of August, when the temperature of the water was 34° to 31°·2 Fahr. Some fish, hitherto considered to be comparatively rare in the Murman sea, were found to be quite common, the *Sebastes norvegicus* for instance, while *Drepanopsetta* is not nearly so rare as might be expected. An unusually rich fauna of crustaceans is distributed over the sea as far north as 75°, and westwards to Bear island. Among these *Pandalus borealis* is especially conspicuous, generally occurring at depths of more than 100 fathoms, but sometimes in the fiords at very moderate depths. The stomachs of codfish were sometimes full of them. On the banks, *Mallotus articus*, *Ammodytes tobianus*, or herring, seem to form the chief food of the cod. Perhaps the bright silvery colour of these fishes render them more conspicuous than the shrimps, but in the semi-obscurity of depths of 100 fathoms they are probably detected by their strong odour. As a rule there is no great quantity of fish at a distance from the coast, but at certain times a considerable number of excellent quality may be obtained. The extensive banks to the north of Kildina and the Teriberka are very productive fishing-grounds. Haddock and plaice are very plentiful on the banks of the Kanin peninsula, and off Bear island fish were very abundant. The deep mud-covered tract of the Murman sea contains no marketable fish, unless the Polar cod (*Gadus saida*) be reckoned as such. The fishing industry is capable of great development; in 1893 the Russian fishermen, about 3500 in number, gained on an average about £9 10*s.* per head, and in 1894 £11 4*s.*, whereas at the Lofoten isles the average is £9 1*s.* per head, and in 1894, £10 14*s.*, whereas the average is £8 18*s.* to £9 9*s.* The temperature observations were not all taken at the same fairly limited areas, and the influence of the fiords had to be allowed for. The curves that have been traced do not, however, show any great deviations from the actual temperatures, except in the upper layers of water, where there are sudden and irregular variations due to particular causes. On the whole the highest readings for the three warmest months were, in 1898, 49½° Fahr. on the surface, and falling to 42¼° at a depth of 250 metres (about 137 fathoms), while in 1899 the corresponding readings were 46¾° and 42°. The summer heat penetrates very gradually to the lower depths, so that the warmest months are July to September on the surface, and September to January at 250 metres. At this time the water in the depths has a higher temperature than the surface water. In the coldest months the temperature is 34° to 38° in the upper layers, and 34° below. Fiords shut off from the sea by a submarine bar have cold water in their lower depths, as in other lands. In the Katherine harbour the low temperature of 35° prevails throughout the year (*Bull. de l'Académie Imp. des Sciences de St. Pétersbourg*, May, 1900).

ASIA.

The Distribution of Malaria in the Ganges Delta.—A paper by Leonard Rogers in the *Journal of the Asiatic Society of Bengal* (vol. lxix. pa[illegible] No. 4) gives the results of investigations of considerable importance in relatio[illegible] the question of the distribution of malaria and its causes. The tract of cou[illegible] dealt with extends on the east bank of the Hugli for 25 miles from Calcutta, [illegible] area long looked upon as water-logged and very malarious. A scheme for excavating certain silted-up drainage channels has been on foot for some time, an unusual prevalence of fever in 1889 was the immediate inducement to investigations, which were carried out as follows: As far as possible, one hund[illegible] persons, half of them children, were examined in each municipal ward, wit[illegible] view to ascertaining the numbers suffering from enlarged spleen, this being tak[illegible] as the best test for the degree of malaria prevailing. Secondly, the level of [illegible]

ground-water was taken in as many wells as possible. Thirdly, the drinking-water supply was carefully noted. Fourthly, the number of fever-cases treated was compared with the monthly rainfall over a series of years. And, lastly, observations were made on the distribution and monthly variation in the distribution of the *Anopheles* mosquito. In regard to the first subject, it was found that places on the banks of the Hugli have a much lower spleen percentage than those further east, which, however, comparison with other places showed to be in no worse position as regards spleen than the typical Lower Bengal municipality. The healthiness of the riverine area cannot be explained by any theory of water-logging in the more inland districts, no marked or constant difference in the ground-water level having been observed. The explanation, both of the broad characteristic above noted, and of the ward variations in spleen-rate, was found in the varying character of the water-supply, the most healthy wards of all being those using filtered water, the next those using river-water, and the most malarious those with only a tank supply. As regards the breeding-grounds of the mosquitos, Dr. Rogers found that, so far from these being limited, as is supposed by Major Ross, to small pools with no fish, the *Anopheles* larvæ swarmed both in large tanks and in small pools, the former, as well as some of the latter, abounding in fish. In the 5 square miles of Maniktola alone there must be several hundred tanks, so the chance of destroying the larvæ must be exceedingly remote. Dr. Rogers also failed to find any cases of fever near the infected tanks in hot weather, and he considers it open to question whether malaria is contracted only or even most commonly through the agency of mosquitos. A good water-supply is, at any rate, he thinks, an important prophylactic against malarial fever.

AFRICA.

Sir Harry Johnston on Uganda.—Sir Harry Johnston's final report, supplementing the preliminary report noticed in the *Journal* for February last (vol. xvii. p. 151), was issued during July. The more purely geographical results of the special commissioner's travels over the greater part of the protectorate are not dealt with in the report, but will, it is hoped, form the subject of a paper during the next session of the Society. All who are interested in the development of Africa will, however, find much that is instructive and suggestive in the report, although some will no doubt be disposed to think that Sir Harry Johnston takes an unduly sanguine view in certain matters. After a brief sketch of the recent history of the protectorate, the commissioner sums up what he considers the principal reasons why the possession of the country is of importance to Great Britain. Apart from the question of the water-supply of the Nile, and the necessity that one at least of the main sources of that supply should be under our control, he holds that on account of our Indian Empire we are compelled to reserve to British control a large portion of East Africa, which is, and should be from every point of view, the America of the Hindu, where Indian trade, enterprise, and emigration may find a suitable outlet. The large sums hitherto spent by the British taxpayer may, Sir H. Johnston thinks, quite possibly be ultimately repaid, while a positive profit may be expected from the opening up of the region to British commerce, and, in a less degree, settlement. In the eastern part of the Uganda protectorate there is, we are told, a tract of country of about the size of Belgium almost without parallel in tropical Africa. It is admirably well watered, with a fertile soil, covered with noble forests, and to a great extent uninhabited by any native race, and, moreover, as healthy for European settlers as the United Kingdom, British Colombia, or temperate South Africa. Of the resources, from which a profitable trade might be developed, rubber is placed first, some 30,000

square miles being more or less densely covered with rubber-producing trees and vines. This area has been set apart by agreement with the native chiefs as directly under the control of the crown. Natives are, however, permitted to collect the rubber on condition of following the rules prescribed by the scientific department, which under its director, Mr. Whyte, has already done much to instruct the people in the proper methods of procuring the rubber. Of the prospects of success in the domestication of the elephant, zebra, ostrich, wild ass, and even the giraffe, Sir H. Johnston speaks hopefully. An important section deals with the question of the advantages derived by the natives of the country from British rule. It has become of late somewhat the fashion to lay stress rather on the evils than on the benefits resulting from the establishment of European control over native races, and it is therefore satisfactory to learn that the benefits in the case of Uganda are very real and fully appreciated by the natives themselves, who have a lively remembrance of the horrors enacted under their native rulers. The report does not say much of the future organization of the country, but the commissioner insists on the importance of governing as far as possible through native agency. The map is useful as showing the limits of the provinces and districts into which the protectorate has been divided.

The Uganda Railway.—The Parliamentary paper recently issued on the subject of the Uganda railway is largely made up of technical details respecting the construction of the line, on which Colonel Gracey, R.E., was, towards the end of last year, commissioned to make a report. The sections of this report, which are of most general interest, are those dealing with the probable date of completion, and with the present traffic and future prospects of the line. Colonel Gracey reports favourably on the whole on the manner in which the work has been carried out, though criticizing the methods employed in certain minor details. In February last the rails had reached mile 476, and, allowing a margin for contingencies, Colonel Gracey estimates that they should reach Lake Victoria about October of this year, that the earthwork should be completed about March, 1902, and the American viaducts a very few months later. This will not, however, mean that the whole work is completed, there remaining almost the entire ballasting, repairs to banks and cuttings, terminal works at Kilindini and Port Florence, etc. While approving of the site chosen by Mr. Whitehouse, the chief engineer, for the temporary terminus at Port Florence, Colonel Gracey holds that Port Florence itself cannot be considered a desirable site for the large town which will certainly spring up round the railway port, being a shallow and land-locked inlet, with no tidal movement or rivers to purify the water. With regard to the prospect of the line from a paying point of view, he says that no sudden developments can be expected, but that, although the immediate prospects are not very bright, a small net return on the capital expended may be reasonably looked for after about 1910. The rates and fares now charged (though very much lower, it may be remarked, than those on the Congo railway) are high as compared with those charged in India, and Colonel Gracey strongly urges the necessity of a reduction, especially in the case of such articles as salt, food grains, seeds, hides, indiarubber, coffee, etc., the cheap transport of which is vital to the interests of the country. With present charges the railway will prove useless for commercial development. Without it, however, it would be impossible for any length of time to hold the country round the headwaters of the Nile.

The Upper Branches of the Sobat.—In putting before the readers of *Globus* (vol. 79, p. 379) an account of Major Austin's work on the Sobat, as described in the May number of the *Journal*, Herr Brix Forster calls in question the identification by that officer of the river called by him Akobo with the stream traced from

near its source by Wellby (*Journal*, vol. xvi. p. 302). Owing to the scanty indications furnished by the latter traveller, the correct identification of his river must be a matter of difficulty, and there is no doubt something to be said for Herr Forster's views. How, he asks, can the Ruzi of Wellby, which flows generally from south to north, be the Akobo, which, as originally explored by Bòttego, was found to have a course from south-east to north-west? The latter river, in Herr Forster's view, is that seen by Wellby joining the Ruzi from the south-east in 7° 50′ N., or very nearly in the latitude given by Austin for the junction of the Akobo with the western branch of the Pibor. This certainly fits in with the statement of Wellby that after the junction the combined river flowed *north*. On his sketch-map, however, the direction is given as north-west, or still that of the Akobo, and this is maintained for some 30 miles below the junction. Again, Bòttego showed various small streams as joining the upper Akobo from the south, one of which might well be the (eastern) Ruzi of Wellby, which Dr. Donaldson Smith's latest journey shows to be quite an insignificant stream in its upper course. Herr Forster makes no reference to the work of the de Bonchamps Mission as embodied in M. Michel's map, and this seems to favour Major Austin's identification. The map alluded to shows the Pibor (on which is the village of Akobo) and the Ajuaru in a way which agrees fairly well with the delineation by Wellby of the two Ruzi's, except that the point of junction is placed much further north-west by the French travellers. The actual junction, however, does not seem to have been seen by Wellby, who was at the time on the east side of the Eastern Ruzi. Major Austin's identification of the river seen by Wellby coming from the south-east with the Gelo, seems, however, more doubtful, owing to the great discrepancy in latitude. But it is to be remarked that another stream is shown on Wellby's map as entering from the east a little north of 8°, and this might perhaps be the Gelo. It is obvious that the names Kier or Baro on that map should properly be assigned to the stream there marked Sobat.

Dr. Kandt's Latest Journeys.—Following up his exploration of the Nyavarongo, the northernmost of the upper branches of the Kagera, Dr. Kandt has carried out his intention of completing his investigation of the Nile sources by the survey of the Akanyaru (*Mitt. aus den Deutschen Schutzgebieten*, 1901, part 2). The expedition for this purpose was undertaken in July of last year, the traveller proceeding first to the Rusizi valley with the intention of climbing the slopes of the eastern escarpment to the neighbourhood of the source of the Akanyaru. The dread of the unknown forests, with which the slopes are clothed, exercised such an influence, however, on his men (natives of Ruanda) that Dr. Kandt was forced to give up the attempt and proceed first to the junction of the Akanyaru with the Nyavarongo. On the way thither he visited the court of the Sultan of Ruanda, where the deception hitherto practised on all Europeans by the substitution of a fictitious for the real sultan was, to Dr. Kandt's surprise, abandoned. The true title of the sultan is said to be Mwami, not Kigeri, which was the popular name of the former Sultan Luabugiri. Dr. Kandt reached the confluence of the rivers at the end of the dry season, the most favourable time for judging their relative size, as the papyrus swamps which fringe the true channels were dry. The result of the renewed measurements was to emphasize more than ever the relative importance of the Nyavarongo, which had double the width, with four or five times the rate of flow, of the Akanyaru, the depth being about the same. After surveying a portion of the Kagera below the junction, Dr. Kandt ascended the Akanyaru, which flowed from the south through a wide papyrus-filled valley, cleared for cultivation beside the stream, and giving evidence of most fertile soil. The lakes of the Kagera were dry at the time, but one containing water was found to communicate with the

Akanyaru, and is identified by the traveller with the Lake Akanyaru of Stanley. At the point where the river had been crossed by Baumann, Dr. Kandt left it, as its upper course, flowing from north-west to south-east, was already known to him. He visited the mission station of Isavi, where many signs of progress were noticed, and from this centre made excursions through the neighbouring districts. He had begun to master the Ruanda language, of which he was preparing an extensive grammar and vocabulary, and was thus able to make good progress with his ethnological researches, which brought to light material of much interest. Dr. Kandt, who hopes to continue his scientific work in Ruanda for some time longer, looks forward to the day when the country will be opened to European colonization by means of a railway.

The Kivu Frontier Delimitation: Death of Dr. Lamp.—The death, from sunstroke on June 21, of Dr. Lamp, leader of the German section for the delimitation of the frontier between German and Belgian territory in the neighbourhood of Lake Kivu, has lately been announced. Dr. Lamp was eminently fitted for the work with which he had been entrusted, having worked both at the Geodetic Institute of Berlin and at the Observatory at Kiel, where he was also a professor at the University. Much had been hoped from his labours towards the improvement of the map of Eastern Central Africa, and something had already been done in this direction, in particular by the accurate fixing of the longitude of Tabora. The death of the leader of the Belgian section, from black-water fever, has also been reported.

Death of Mr. W. H. Harding in Barotseland.—The news comes from Fort Monza, in Barotseland, of the death of Mr. W. H. Harding, who was acting as secretary to Colonel Colin Harding, C.M.G., and who, in addition to being in charge of the post at Fort Monza, had, after his return from the Zambezi expedition, made a successful tour to the boundary of the Mashukulumwe country, crossing the Kafue river, and then bearing north-north-east for seven days. During a two months' journey in this unexplored district he had taken observations for mapping purposes in addition to enrolling, organizing, and drilling the Barotse native police. His death, which was very sudden, was due to black-water fever. He was a useful and successful pioneer, and had become a *persona grata* with king Lewanika and the numerous indunas, and was doing most valuable work for the empire and in the cause of geography.

AMERICA.

The British Columbia-Yukon Boundary.—A survey has lately been carried out under the direction of the Surveyor-General of Canada of the country along the boundary-line between British Columbia and the Yukon territory, which is constituted by the 60th parallel of north latitude. Reports on a portion of the work (that between Lake Bennett and Teslin lake) by Messrs. St. Cyr and White-Fraser, appear in the Annual Report of the Department of the Interior for 1900, accompanied by a map. The district is exceedingly difficult to travel, being filled with mountain ranges trending north and south, separated by deep narrow valleys. These mountains, which branch off the main range separating the Pacific basin from that of the Yukon, have the barren wild appearance of the snow-clad peaks of the coast range. The highest point (6500 feet) in the section of the boundary under discussion lies between Windy arm and Taku arm, both branches of Tagish lake which connects with Lake Bennett at Caribou on the White pass and Yukon railway. East of Taku arm the country is densely wooded with spruce and pine, averaging 8 inches in diameter. A meridian through Atlin lake (some 12 miles east of Taku arm) would divide the district into two distinct conformations. West

of such a line the mountains are majestic rock masses, while to the east the hills form a rolling landscape, from which a great peak will only occasionally stand out. Along the whole line from Atlin lake to Teslin it is quite unusual to come across a ledge of rock, the hills being covered to their very tops with a drift deposit of granite and quartz pebbles. The summit of Dawson peak overlooking Teslin lake rises out of this deposit, however, and forms a majestic mass of jagged precipices. In protected gulches, raspberries, black and red currants, and various other berries were seen in great abundance, and in open places the nutritious bunch grass grows luxuriantly. The animal life is abundant, including various bears, moose, caribou, mountain sheep and goats, and many smaller animals, grouse, ducks and geese, and other birds, while the streams and lakes are full of fine fish. Mr. White-Fraser's remarks on the mosquitos are interesting from the point of view of the distribution of the pest. The shortness of the season (June to August) during which these insects are active, is made up for by their vigour and pertinacity during that time, the traveller being attacked by them in dense clouds. An occasional respite is enjoyed through the fact that the mosquito apparently requires a temperature above 39° Fahr., and as the summer night-temperature generally falls below that point, it gets benumbed and drops into the grass. The whole region would appear to be useless except for mining, and the probability of any finds east of the Atlin line is small. The timber is too small to be of much use, and, though hay might be put up for winter use, the country is unfitted for grazing. After mining ceases to be productive, the country will, in Mr. White-Fraser's opinion, lapse once more into an extensive hunting and trapping country.

POLAR REGIONS.

Return of Polar Expeditions.—The return to Sandefjord of the expedition under Captain Stökken, organized by the Duke of the Abruzzi for the purpose of searching for the three lost members of his polar expedition of 1899–1900, was reported on August 17. The southern coasts of Franz Josef Land had been examined without the discovery of any trace of the missing men or clue to their fate. A memorial was, as arranged for by the Duke, erected on Cape Flora. Another expedition, which has so far proved unsuccessful, is that of Captain Bauendahl, who sailed last autumn, it will be remembered, in a small vessel with very inadequate equipment, in the hopes of pushing north by the Franz Josef Land route. Captain Bauendahl wintered at Danes island, Spitsbergen. According to news received from Norwegian whalers, and published in *Petermanns Mitteilungen* (No. 7), Captain Bauendahl is sending his ship home, and proceeding to East Greenland in a boat with one companion only, in the hope of pushing northward by that route.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Geoid and the U.S. Coast and Geodetic Survey.—An arc of the parallel of 39° N. lat. has lately been measured in the United States (U.S. Coast and Geodetic Survey, "Special publication, No. 4," summarized in the January number of the *National Geographic Magazine*). It extends from Cape May on the Atlantic coast to Point Arena on the Pacific coast, passing over 48° 46′ of longitude, and measuring 2625 miles. The triangulation has been developed from ten base-lines with an aggregate length of 53½ miles, the longest or Yolo base being 10·9 miles long. Among the Rocky mountains many of the sides of the triangles have lengths exceeding 100 miles, and one attains to 183 miles. The altitude of some of the stations is very considerable, as, for instance, Pike's peak, 14,108 feet, and Mount Elbert, 14,421. Distributed over the arc, or near it,

are one hundred and nine latitude stations and seventy-three azimuth stations, and twenty-nine longitudes have been determined by telegraph. The deviation of the plumb-line in the mountainous region is very large—at Patmos Head station, 12″ to the north; at Colorado Springs, 25″ to the west; and at Genoa station, Nevada, 29″ to the west. These are obviously accounted for by the masses and position of the mountains. But even in level country the average deviation is about 2·5″, and must be ascribed to the continental attraction, and the calculations of the American geodesists show that for about four-sevenths of the arc from its eastern extremity the equipotential surface of the geoid approaches closely to that of Clarke, while for the remainder the curvature is nearer to that of Bessel's ellipsoid of revolution. Another arc extends from Calais, Maine, opposite the Canadian frontier, and runs obliquely across the States to New Orleans, having a length of 1623 miles. The difference of the latitudes of its extremities is 15° 1′, and the longitudes 22° 47′. It passes over the two highest points in the eastern States—Mount Washington, 6300 feet, and Mount Mitchell, 6687 feet. Thirty-six determinations of latitude, fourteen of longitude, and thirty-four of azimuths have been used in ascertaining the elements of the spheroid most closely coinciding with the actual figure of the Earth. The elements of Bessel's spheroid and of Clarke's of 1866, which was adopted by the Coast and Geodetic Survey in 1880, are as follows:—Bessel's spheroid (1841): Equatorial radius (a) in metres = 6,377,397; Polar semi-axis (b) = 6,356,079; $a - b$ = 21,318; polar compression $\left(\frac{a-b}{a}\right) = \frac{1}{299 \cdot 15 \pm 3 \cdot 15}$. Clarke's (1866): a = 6,378,206; b = 6,356,584; $a - b$ = 21,622; $\frac{a-b}{a} = \frac{1}{295}$. The results of the American calculations are, for the equatorial radius, 6,378,157 ± 90 metres, or only 49 metres less than Clarke's; and for the polar compression $\frac{1}{304 \cdot 5 \pm 1 \cdot 9}$, which ratio is nearer to that of Bessel, and gives the geoid a form more closely approaching to a sphere.

GENERAL.

The World's Timber Supply.—Although the question of the timber-supply of the future is one of which the importance has been urged by experts for a long time past, the subject has hitherto failed to attract sufficient attention for any practical outcome to result. There are signs, however, that public attention may be at last aroused to the necessity of action if the necessary timber-supply of the world is to be maintained. In France the subject was lately brought forward by M. Melard, Inspector of Forests, at Paris; while a careful examination of the question in the light of recent statistics was lately put before the Society of Arts by Dr. W. Schlich, the well-known Professor of Forestry at Cooper's Hill College (*J.S.A.*, March 1, 1901). Both of these writers have shown that it is within the bounds of possibility that an actual shortage in the production of timber may be experienced in the near future. Such is the increasing demand in the principal industrial countries of the world, that even were the present supply to remain constant, it would not by any means suffice for the requirements of the world but a few years hence. Taking first the countries of Europe, Dr. Schlich divides them into importing and exporting countries; the former category including, in descending order, Great Britain and Ireland, Germany, France, Belgium, Denmark, Italy, Spain, Holland, Switzerland, Portugal, Bulgaria, Greece, and Servia; the latter, Russia (with Finland), Sweden, Austria-Hungary (with Bosnia and Herzegovina), Norway, and Rumania. In Great Britain and Germany respectively, the average annual imports during the last five years have stood at

22 million pounds' worth and 14 million pounds' worth respectively, France coming third with only 3 million pounds' worth. In the case of the two first, the annual increase in the amount imported has been steadily rising of late. An examination of the state of affairs in the principal exporting countries of Europe leads to no very hopeful conclusions. These are summed up thus. The exports from Norway have already begun to fall off, while those of Austria-Hungary must soon follow suit. Sweden may increase her exports to a moderate extent, while Russia is at present a doubtful factor. The net deficit for Europe as a whole amounts to 2,600,000 tons, which is made good by the net export from non-European countries. Of these, the United States and Canada alone supply any appreciable amount, the other exporting countries supplying chiefly expensive hard woods which cannot fill the place of coniferous timber. Dr. Schlich shows that, though the recent increased demand has been met by the United States (Canada having actually diminished her export to Europe of late years), this increased rate of export cannot be maintained, in spite of the attention lately paid to forestry in that country. In fact, the United States must, like Austria, cease to be an exporting country within a limited number of years. Canada, on the other hand, is capable of an increased export if no time is lost in introducing a rational management of her forests. This, however, is an indispensable condition. Lastly, Dr. Schlich shows that, with all the forest wealth of our colonies, the British Empire as a whole imports now annually timber valued at close on £18,000,000, and strongly urges the need of a more vigorous forest policy throughout the empire. In the United Kingdom alone we have more than sufficient surplus land to produce the whole amount required, without touching existing woodlands or putting a single acre out of cultivation. But in order to ensure financial success, the provision of scientific instruction in forestry is, among other measures, urgently needed.

Pierre Garcie and his Works on Navigation.—An interesting account of Pierre Garcie, the author of one of the earliest books of sailing directions, is given in the *Bulletin de Géographie Historique et Descriptive* (1900, p. 135) by M. Auguste Pawlowski, who corrects certain mistakes into which bibliographers have fallen with respect to Garcie's works. In the first place, he shows that the earliest known edition of the 'Grand Routier' is that of Poitiers, printed by Enguilbert de Marnef in 1520. The statement of Sir Travers Twiss, in 'The Black book of the Admiralty' (1873), that the Bodleian possesses an edition of 1483, is inexplicable, inquiry having shown that the Bodleian edition is one of the last issued at Poitiers, probably about 1549. The 1520 edition has been supposed to have appeared during Garcie's lifetime, but M. Pawlowski considers it more probable that it was brought out by Marnef from Garcie's manuscripts. The most interesting fact brought out in the paper is perhaps that of the existence of a 'Petit Routier,' of which a single copy only is known (in the Bibliothèque Nationale at Paris), which internal evidence shows almost certainly to have been also the work of Garcie. Out of twenty-two chapters eight are reproduced almost verbally in the 'Grand Routier,' six others appear in the latter with modifications or additions, while eight only do not appear in the 'Grand Routier.' Their omission is attributed by M. Pawlowski to the use of an incomplete manuscript by Marnef, as the chapters all refer to countries familiar to Garcie during the course of his many voyages. The 'Petit Routier' also helps to clear up certain doubtful points respecting the 'Rôles d'Oléron,' the first code of maritime law current in the Atlantic during the middle ages, while another point of interest about it is the fact that it, and not the 'Grand Routier,' was the original of the 'Rutter of the Sea,' of which a copy (dated 1536) belongs to the Library of Lincoln's Inn.

M. Pawlowski considers it proved that Garcie was the only really original French writer on hydrography from the fifteenth to the close of the sixteenth century.

Natural versus Official Nomenclature in Mountain Districts.—M. de Martonne, whose recent studies in the Carpathians have more than once been referred to in the *Journal*, has a note in the *Bulletin de Géographie Historique et Descriptive* (1900, p. 83) on the mountain nomenclature in districts little affected by outside influence, as compared with that prevailing in ranges frequently visited by the tourist or surveyor. The former are not easily met with in Europe at the present day, but in the Southern Carpathians, sometimes known as the Transylvanian Alps, he found unusual facilities for studying the question, the fact that the northern versant of the range has been brought within the sphere of action of the Austrian Survey Department permitting the two styles of nomenclature to be observed side by side, with various grades of transition between them. On the unsophisticated southern slope, the following characteristic facts were noticed by the writer. Firstly, the place-names are very frequently adjectives, denoting a special physical peculiarity, and repeated again and again in very different regions. Examples of this are Zanoaga (a high cirque-like valley), Cheia (a narrow gorge), and many other names. Secondly, nearly all the other names are formed of generic expressions (*e.g.* Deal = height) compounded with names of men, animals, etc. Thirdly, the wealth of nomenclature is in inverse proportion to the complexity of the surface features, an extreme poverty of names being noted in the high mountain zone. This is due to the simplicity of social condition and scarcity of population in that zone. Fourthly, while we are accustomed to base the nomenclature on the *summits*, the peasants bestow names in the first instance on the *valleys*. Much confusion may arise from the failure to recognize this, a mountain crest having, as a rule, different names in the valleys which it separates. A similar state of things has often been recognized as existing in the Alps and elsewhere, the names now attached to mountain peaks having frequently been applied, originally, to the pastures below them used by the villagers in their neighbourhood.

Mountain Passes.—Miss Ellen Semple, whose interesting account of the dwellers in the Kentucky mountains appeared in the June number of the *Journal*, contributes to the *Bulletin* of the American Geographical Society (1901, No. 2) an excellent study in anthropogeography on the subject of Mountain passes. The paper begins with a general consideration of mountain ranges in their bearing on the history of the nations, the great differences observable in different ranges as regards facilities of intercourse between the two sides being pointed out. Thus the Hindu-Kush is instanced as an example of a range presenting open doors to the passage of invaders, while the Alps and the Appalachian system also allow fairly easy transit across them. The Caucasus and the Pyrenees present much more formidable barriers, and on this account the importance of the passes between the sea and one or both extremities of the range is enhanced. The peculiar character of the Pamirs has caused them to be a great highway from west to east from the earliest times. The four different kinds of passes distinguished by as many names by the Kirghiz, may, the writer thinks, serve as a basis for classifying passes in general. The almost complete break or dip in a mountain system is represented by the natural depression of the Hudson and Mohawk valleys, or the gap of Belfort between the Vosges and the Alps. Allied to this type in its low elevation, but differing in other respects, is the deep saddle by which an individual ridge is broken, such as the Brenner. Higher passes may be grouped together, though presenting many minor differences. Thus the summit of the Little St. Bernard is a pasturage plain, while the Brèche de Roland in t

Pyrenees is a portal only 300 feet wide. Quite as important as the pass or gap is the nature of the avenue of approach to the same, and this is, of course, determined by the general structure and relief of the range, the transverse valley of erosion affording the greatest facilities for communication. It is the flanking valleys of approach which draw to themselves all the active life of the mountains, while the passes themselves have only emergency inhabitants. Where no carriage route has been constructed over the summit, as is generally the case in the Pyrenees, a small settlement springs up where such road ends and the mule-path or foot-trail begins. Lower down the valley there will probably be a spot where side valleys converge, each perhaps itself leading to a pass, and this becomes necessarily a focus of life and trade. Such points are Chiavenna, Aosta, and Bellinzona. The paper, which is to be continued in a subsequent number, contains here and there statements which might be misleading. From the account of the ranges between India and Baluchistan it might be thought that they present little barrier to intercourse, while from the reference to Hannibal in connection with the Little St. Bernard it might be supposed that no doubt existed as to the pass used by the Carthaginian general.

Annual Report of the Russian Geographical Society.—We have just received the Annual Report of the Russian Geographical Society for the year 1900, which includes the belated reports of the Turkestan, East Siberia, Orenburg, and Amur branches of the Society for 1898 and 1899. During the past year the Society has sustained several heavy losses, by the death, among others, of Prof. V. V. Vasilieff, one of the best authorities on Buddhism in Europe, and the author of two capital works, 'Buddhism, its Dogmas, History, and Literature,' and 'Graphic System of Chinese Hieroglyphs;' of Prof. S. I. Korschinski, who was an excellent botanist, and after his numerous journeys in Russia, Siberia, and Turkestan had begun to prepare a 'Flora of Russia;' the ethnographer, L. N. Maïkoff; D. G. Anuchin, ex-Governor-General of East Siberia; and the meteorologist, F. F. Müller. Of expeditions, three were at work during the year: the "Tibet expedition" of Kozloff; the Korean and Sakhalin expedition under P. J. Schmidt; and the Kamchatka expedition, now under V. N. Tyushoff. Dr. N. A. Zarudnyi was also carrying on investigations in Persia, and a couple of small expeditions were at work in European Russia. Dr. Zarudnyi, author of an excellent zoo-geographical work, 'Oiseaux de la région Transcaspienne,' is continuing the same kind of work in Persia. Of the various publications in contemplation, we notice with great interest that D. N. Anuchin is about to publish the valuable observations of Miklukho-Maklay in the East Indies, Micronesia and Polynesia, which have been hitherto known by short abstracts only. The Constantine medal was awarded this year to the indefatigable explorer of Asia, V. A. Obrucheff. His work in the Transcaspian territory, then in the Olekma and Vitim highlands, and later on in East Mongolia, for which his explorations are epoch-making, are well known to the scientific world. His four years' work in Transbaikalia, in connection with the Siberian railway, is less known, but equally important, while his recent explorations on the coasts of the Pacific are only known as yet from short preliminary reports. The Lütke medal was awarded to M. E. Zhdanko for his hydrographical, magnetical, and geodetical work extending over several years; the Semenoff medal to J. A. Kersnovsky for meteorological work; and the Prjevalsky medal to V. V. Sapozhnikoff, professor at Tomsk university, who has explored the flora and the glaciers of the Altai, proving that glaciers are to be counted in the Altai by hundreds, and that the valleys of these highlands bear unmistakable traces of a former much greater extension of glaciers. The results of his three years' journeys are now embodied in a work entitled 'The

Katun River and its Sources,' with maps and a catalogue of heights and a summary in French. Small gold medals were awarded to N. A. Busch for the exploration of the glaciers and the botany of Northern Caucasia; to V. S. Moshkoff for ethnographical work; to P. Th. Unterberger for his work, 'The Maritime Province.' A number of silver and bronze medals were distributed for minor works. Of the various work done by the Turkestan branch of the Russian Geographical Society, we must mention the exploration of Central Asian lakes, including Lake Aral (mentioned *ante*, p. 86), and M. A. Kirchhoff's and P. K. Zalessky's surveys of the upper Panj, which give to it a position from 8′ to 9′ more to the west than on our present maps. As to L. S. Berg's exploration of Lake Aral, it proves that, although the lake was undoubtedly in a period of desiccation previously to 1880, it has certainly begun to decrease once more since that date, covering some of the recent islands. Its level must have been raised by full 7 feet within the last twenty years. In the work of the East Siberian branch, the exploration of the Munku-Sardyk peak and Lake Kossogol deserves special mention. The depth of the latter exceeds, in places, 70 fathoms. The biological station at Goloüstnaya, on Lake Baikal, has unfortunately been closed for want of money, but extremely interesting collections of fishes (chiefly of the Cottus genus) and of crustaceans, have been made. The latter are now in Norway, in the hands of Dr. Sars.

OBITUARY.

Prince Henry of Orleans.

Prince Henry of Orleans, who by his daring journeys in Central and South-Eastern Asia had taken a foremost place amongst recent explorers of that continent, died at Saigon on August 9 from the results of an operation necessitated by abscess of the liver. The elder son of the Duc de Chartres, Prince Henry was born in 1867, and was thus little more than twenty years old when he undertook, in company with the well-known traveller M. Bonvalot, his first journey in Central Asia, which eventually led the explorers from north to south across some of the least-known portions of Tibet, bringing them at last to the shores of Tongking. The first expedition in which the prince proved his capacity as leader was that in which the least-known portions of the Indo-Chinese peninsula were for the first time crossed from east to west. In this journey, which the prince described in person before our Society in 1896, and afterwards in a thrilling narrative translated, soon after its appearance, into English, portions of the Mekong and Salwen, for the mapping of which we had to depend on the old survey carried out at the instance of the French Jesuits in the eighteenth century, were for the first time explored by a European; while by striking across the upper basin of the Irawadi to Assam, the expedition virtually set at rest the question of the sources of that river. Prince Henry had of late years become a mouthpiece of the advanced colonial party in France, and had thus been brought somewhat into antagonism with British interests, especially in Abyssinia, to which country he undertook an abortive expedition in connection with the De Bonchamps mission. It is, however, to his geographical work, which, as already shown, was of considerable importance, that we must confine our attention here.

Baron de Santa Ana Nery.

We regret to record the sudden death, which lately occurred at Paris, of our honorary corresponding member, Baron de Santa Ana Nery, known for his writings on matters relating to Brazil, of which country he was a native. Of these works perhaps the most important were, 'Le Pays des Amazones,' published in 1885, and afterwards translated into English; and 'Le Brésil en 1899,' a general account of the country published in connection with the Paris Exhibition of 1889, at which he represented his native land. He was also a delegate of the Geographical Society of Rio de Janeiro at the London meeting of the International Geographical Congress. The baron had for many years resided in Paris, where he acted as correspondent of the *Jornal de Commercio* of Rio de Janeiro.

F. W. W. Howell.

A regrettable accident was reported during August from Iceland, which resulted in the death of the well-known traveller Mr. Frederick W. Howell, who by his venturesome journeys has done more to add to our knowledge of the remoter parts of Iceland than any other Englishman. Mr. Howell, who resided formerly at Sutton Coldfield, and latterly at Handsworth, near Birmingham, made his first important journey in 1890, in which year, starting with three men from Svinafell, he reached a point on the ice-clad peak of Oræfa Jökull, 6100 feet above sea-level, or only some 150 feet below the summit, the complete conquest of the peak being only prevented by a violent snowstorm. Returning to the attack in 1891, he was this time successful, effecting on August 17 the first ascent of the mountain, which he subsequently described in the *Proceedings* of our Society in 1892. Mr. Howell created a second record in 1899 by crossing for the first time, in company with two young Oxford men, the great ridge of the Láng Jökull, with its vast ice-fields. He has since continued his explorations, and was at the time of his death, according to news received in this country early in August, crossing with guides the Heradovotz river, when his horse, becoming entangled in a quicksand, began plunging about. Mr. Howell was thrown from the saddle, and, being carried away by the strong current, was drowned. He had been a Fellow of our Society since 1891.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. *Sitzb. A.W. Berlin* (1901): 170–185. **Salomon.**

Ueber neue geologische Aufnahmen in der östlichen Hälfte der Adamellogruppe. Von Prof. Dr. Wilhelm Salomon.

Ardennes. **Arçtowski.**

Quelques mots relatifs a l'étude du Relief de l'Ardenne et des directions que suivent les rivières dans cette contrée. Par Henryk Arçtowski. (Extrait du Bulletin de la Société Belge de Géologie, de Paléontologie et d'Hydrologie, tome ix., 1897.) Bruxelles, 1901. Size 9½ × 6½, pp. 118–127. *Sketch-maps.*

Austria—Bohemia. **Forbes.**

Sugar Industry of Bohemia. Foreign Office, Miscellaneous, No. 554. 1901. Size 9½ × 6, pp. 6. *Price ½d.*

Austria—Bosnia, etc. *Abh. G. Ges. Wien* 3 (1901), (No. 2): 1–86. **Cvijić.**

Morphologische und Glaciale studien aus Bosnien, der Hercegovina und Montenegro. II. Theil: Die Karstpoljen. Von Dr. Jovan Cvijić. *With Map.*

Austria—Canals. *Questions Dipl. et Colon.* 12 (1901): 14–28. **Daurys.**

La question des canaux en Autriche. Par Henri Daurys. *With Map and Diagram.*

Austria—Earthquakes. *Sitzb. K.A.W. Wien* 108 (Ab. I.) (1899): 33–226. **Mojsisovics.**

Mittheilungen der Erdbeben-Commission der kaiserlichen Akademie der Wissenschaften in Wien. X. Allgemeiner Bericht und Chronik der im Jahre 1898 innerhalb des Beobachtungsgebietes erfolgten Erdbeben zusammengestellt von Dr. Edmund v. Mojsisovics.

Austria—Karlseisfeld. *Abh. G. Ges. Wien* 3 (1901): 1–25. **Hübl.**

Karlseisfeld-Forschungen der K. K. Geographischen Gesellschaft. I. Theil. Die Topographische Aufnahme des Karlseisfeldes in den Jahren 1899 und 1900. Von Arthur Freiherrn von Hübl. *With Maps and Plate.*

Austria—Trieste. **Churchill.**

Trade of Trieste for the year 1900. Foreign Office, Annual No. 2583, 1901. Size 9½ × 6, pp. 22. *Price 1½d.*

Europe—Geodesy. ———

Veröffentlichung des Königl. Preussischen Geodätischen Institutes. N.F. No. 5. Astronomisch-Geodätische Arbeiten I. Ordnung. Bestimmung der Längendifferenz, Potsdam-Bukarest, im Jahre 1900. Berlin: P. Stankiewicz, 1901. Size 11½ × 9, pp. iv. and 56.

Faroe Islands. **Villiers.**

The Faroe Islands. Foreign Office, Annual No. 2589. 1901. Size 9½ × 6, pp. 16. *Price 1d.*

France. **Leitritz.**

La France. Anthologie Géographique. Zum Schulgebrauch herausgegeben von Johannes Leitritz. Zweite Auflage. Leipzig: Rengersche Buchhandlung, Gebhardt und Wilisch, 1901. Size 7½ × 5, pp. xii. and 244. *Map and Illustrations. Presented by the Editor.*

The writer has brought together from a variety of sources information on the geography of France, with illustrations of the national character, manners, etc., of the French, the phraseology and style of the original writers being as far as possible preserved. The present edition has been subjected to extensive revision.

France. *B.S.G. Com. Paris* 22 (1900): 481–504. **Levasseur.**

Géographie Industrielle de la France en 1789. Par M. Émile Levasseur.

France—Chamonix. **Whymper.**

Chamonix and the Range of Mont Blanc. A Guide by Edward Whymper. Sixth Edition. London: John Murray, 1901. Size 7½ × 5, pp. xiv. and 206. *Maps and Illustrations. Price 3s. net. Presented by the Author.*

Visitors to the Alps will welcome the appearance of a new edition of this excellent guide.

France—Paris. **Joanne.**
Collection des Guides-Joanne. Paris, ses Environs et un Appendice sur l'Exposition de 1900. Par Paul Joanne. Paris: Hachette et Cie, 1900. Size $6\frac{3}{4} \times 4$, pp. lxxxiv. 344, 24, 48, 32. *Plans. Presented by Dr. J. S. Keltie.*

France—Puy-de-Dôme. **Boule and others.**
Le Puy-de-Dôme et Vichy. Guide du Touriste, du Naturaliste et de l'Archéologue. Par Marcellin Boule, Philippe Glangeaud, Gilbert Rouchon, Antoine Vernière. Paris: Masson et Cie, 1901. Size $7\frac{1}{2} \times 4\frac{1}{2}$, pp. iv. and 378. *Maps and Illustrations. Presented by Dr. M. Boule.*

This is the third issue of an excellent series of guides to districts of France, edited by M. Boule. It does not appeal only to the tourist, but contains much interesting information on the history, physical geography, resources, etc., of the district.

France and Germany—Railways. *B.S.G. Com. Havre* **18** (1901): 257–274. **Sorel.**
Comment les chemins de fer français facilitent la décentralisation, comparaison avec les chemins de fer allemands. Par M. le Dr. Robert Sorel.

Germany. *Sitzb. A.W. Berlin* (1901): 501–523. **Branco and Traas.**
Beweis für die Richtigkeit unserer Erklärung des vulcanischen Ries bei Nördlingen. Von W. Branco und Prof. Dr. E. Traas.

The authors defend their views as to the volcanic origin of certain features in the "Ries" district from the criticism of Dr. Koken.

Germany. *G.M. Hessen*, I. and II. Heft (1900): 5–102. **Krausmüller.**
Die Volksdichte der Grossherzogl. Hessischen Provinz Oberhessen. Von Dr. Georg Krausmüller.

Germany—Pomerania. *Verh. Ges. Erdk. Berlin* **28** (1901): 232–240. **Halbfass.**
Ergebnisse seiner Seenforschung in Pommern. Von Dr. W. Halbfass.

Germany—Prussia. *Questions Dipl. et Colon.* **11** (1901): 707–722. **Pasquier.**
La question des canaux en Prusse. Par H. Pasquier. *With Map.*

Germany—Rhine Province. *Meteorolog. Z.* **18** (1901): 97–106. **Polis.**
Beiträge zur Gewitterkunde im Hohen Venn und der Eifel. Von Dr. P. Polis. *With Map.*

Germany—Saxony. ——
Zeitschrift des K. Sächsischen Statistischen Büreaus 46 Jahrgang 1900, Heft 3 und 4. Dresden. Size $11\frac{1}{2} \times 9$, pp. 117–240.

Holland. **Schuiling.**
Tijds. K. Ned. Aard. Genoots. Amsterdam **18** (1901): 153–198, 319–342.
De grenzen van de provincie Overijsel en hare landschappen. Door R. Schuiling. *With Map.*

Iceland. *Travel* **6** (1901): 99–104. **Thiele.**
Through Iceland on a Side Saddle. By L. F. K. von Thiele. *With Illustrations.*

On a tour through Iceland with the late Mr. Howell as conductor.

Italy. **Morgan.**
Trade, Commerce, and Agriculture of Italy for the year 1900. Foreign Office, Annual No. 2616, 1901. Size 10×6, pp. 34. *Price $2\frac{1}{2}$d.*

Italy. *Ann. G.* **10** (1901): 225–231. **Mori.**
La Carte d'Italie. Par M. A. Mori.

The new topographic map of Italy, executed by the Military Geographic Institute, was completed last year, as far as field work is concerned, by the survey of the central part of Sardinia.

Italy—Agriculture. *Riv. G. Italiana* **8** (1901): 272–279. **Marinelli.**
La Geografia e la Carta Agronomica d'Italia. Per Olinto Marinelli.

Urges Italian geographers to co-operate in the scheme for an agricultural map of the kingdom.

Italy—Geodesy. *Atti R.A. Lincei Rendiconti* **10** (1901): 284–291. **Reina.**
Determinazione astronomica di latitudine eseguita a Monte Soratte nel 1900. Nota di Vincenzo Reina.

Italy—Lombardy. **Armstrong.**
Agriculture and Trade of Lombardy for the year 1900. Foreign Office, Annual No. 2597, 1901. Size 9½ × 6, pp. 10. *Price* 1*d*.

Italy—Monte Soratte. *Atti R.A. Lincei, Rendiconti* **10** (1901): 346–351. **Reina.**
Determinazione astronomica di azimut eseguita a Monte Soratte nel 1900. Nota di Vincenzo Reina.

Italy—Place-names. *Riv. G. Italiana* **8** (1901): 261–271. **Grasso.**
Sul cambiamento di nome nei Comuni attuali d'Italia. Appunti di Gabriele Grasso.

Mediterranean—Cyprus. *J. Anthrop. I.* **30** (1900): 199–220. **Evans.**
Mycenæan Cyprus as illustrated in the British Museum Excavations. By A. J. Evans. *With Illustrations.*

Norway. *Quarterly J.R. Meteorolog. S.* **27** (1901): 105–115. **Williams.**
The Climate of Norway and its Factors. By C. Theodore Williams, M.D. *Maps.*

Rumania. *C. Rd.* **132** (1901): 1140–1143. **Martonne.**
Sur les mouvements du sol et la formation des vallées en Valachie. Note de M. E. de Martonne.

A note on this has appeared in the Monthly Record (*ante*, p. 210).

Russia—Baltic Provinces. *Deutsche Rundschau G.* **23** (1901): 342–349. **Zweck.**
Bilder von der russischen Grenze. Von Dr. Albert Zweck. *With Illustrations.*

Russia—Don Cossacks. *Oester. Monats. Orient* **27** (1901): 26–29. ———
Die wirthschaftliche und culturelle Lage der Don 'schen Kosaken.

Russia—Meteorology. *Meteorolog. Z.* **18** (1901): 216–223. **Heintz.**
Meber Niederschlagsschwankungen in den Flussgebieten der Wolga, des Dnjepr und des Don während der Periode 1861–1898. Von E. Heintz.

Russia—Poland. **Murray.**
Trade and Agriculture of Poland and Lithuania for the year 1900. Foreign Office, Annual No. 2578, 1901. Size 9½ × 6, pp. 80. *Price* 4*d*.

Scandinavia. *Geolog. Mag.* **8** (1901): 205–216. **Holst.**
The Glacial Period and Oscillation of Land in Scandinavia. By Dr. Nils Olof Holst. Translated by F. A. Bather, D.SC.

Spain. *Globus* **80** (1901): 1–3. **Rzehak.**
Eine Fahrt durch das Becken von Guadix. Von Granada nach Baza. Von Prof. A. Rzehak. *With Illustration.*

Spain—Montserrat. *B.S.R.G. d'Anvers* **25** (1901): 244–256. **Richet.**
Au Montserrat. Par M. Etienne Richet.

States of Europe. **Payart.**
Les Concordances de la Géographie Physique avec le groupement logique, politique, et commercial des États Européens. Communication faite au VII^{me} Congrès International de Géographie à Berlin en 1899. Par E. Payart. Berlin, 1900. Size 10 × 6½, pp. [10].

Sweden. *Ymer* **21** (1901): 113–144. **Lönborg.**
Geografiska och kartografiska arbeten i Sverige under 1600 = talet. Af Sven Lönborg.

Sweden. **MacGregor.**
Trade of Stockholm and Eastern Coast of Sweden for the year 1900. Foreign Office, Annual No. 2590, 1901. Size 9½ × 6, pp. 50. *Price* 3*d*.

Switzerland. *Vierteljahrs. Naturforsch. Ges. Zürich* **45** (1900): 59–136. **Amberg.**
Beiträge zur Biologie des Katzensees. Von Otto Amberg. *With Diagrams.*

Includes an account of the hydrography, geology, etc., of the Katzensee, a small lake to the north of Zürich.

Switzerland. *Vierteljahrs. Naturforsch. Ges. Zürich* **45** (1900): 164–182. **Heim.**
Der Schlammabsatz am Grunde des Vierwald-stättersee. Von A. Heim.

An important paper on the microscopical and chemical examination of specimens of mud from the Lake of Lucerne.

Switzerland. *Vierteljahrs. Naturforsch. Ges. Zürich* **45** (1900): 277–350. **Waldvogel.**
Der Lützelsee und das Lautikerried, ein Beitrag zur Landeskunde. Von T. Waldvogel. *With Map and Plate.*

An elaborate study of the Lützelsee in Canton Zürich, and its biology, as well as of the conditions of vegetation in the surrounding region.

Switzerland—Zermatt. **Whymper.**
The Valley of Zermatt and the Matterhorn. A Guide by Edward Whymper. Fifth Edition. London: John Murray, 1901. Size 7½ × 5, pp. xiv. and 224. *Maps and Illustrations. Price 3s. net. Presented by the Author.*

The merits of Mr. Whymper's Alpine guides are too well known to need being dwelt upon.

Turkish Empire. **Aldinger.**
Beiträge Kolonialpolitik u. Kolonialwirtschaft **2** (1900–1901): 545–546.
Türkische Wanderung und Auswanderung von Rumänien nach Kleinasien. Von Dr. Aldinger.

United Kingdom. *T. and Ninth Annual Rep. Liverpool G.S.* (1900): 71–122. **Nevins.**
The Voyages of the Early Celts to and from the British Isles. By J. Birkbeck Nevins, M.D. *With Maps and Illustrations.*

United Kingdom. *Quarterly J.R. Meteorolog. S.* **27** (1901): 117–140. **Mawley.**
Report on the Phenological Observations for 1900. By Edward Mawley. *Map.*

United Kingdom—Bristol. **Taylor.**
Some of the Public Institutions of Bristol. By L. Acland Taylor. A Paper read before the Library Association, Bristol, September 25, 1900. Bristol: J. W. Arrowsmith, 1900. Size 8½ × 5½, pp. 20. *Presented by the Bristol Museum and Reference Library.*

United Kingdom—Coal. *J.S. Arts* **49** (1901): 549–568. **Bellairs.**
The Coal Problem: its Relations to the Empire. By Lieut. Carlyon W. Bellairs.

United Kingdom—Ireland. *Aarb. Nord. Oldk. Hist.* **15** (1900): 279–332. **Bugge.**
Nordisk Sprog og nordisk Nationalitet i Irland. Af Alexander Bugge.

United Kingdom—Lake District. *Quarterly J. Geolog. S.* **57** (1901): 189–197. **Oldham.**
On the Origin of the Dunmail Raise (Lake District). By R. D. Oldham.

A note on this paper was given in the *Journal*, vol. xvii. p. 300.

United Kingdom—Scotland. **Smith, Paterson, and Watt.**
The Natural History of Ailsa Craig. By John Smith, John Paterson, and Hugh Boyd Watt. (Reprinted from *Annals of the Andersonian Naturalists Society*, vol. ii. part ii. Glasgow, 1900.) Size 9 × 6, pp. 135–154. *Presented by J. Smith, Esq.*

United Kingdom—Yorkshire. **Reed.**
The Geological History of the Rivers of East Yorkshire. Being the Sedgwick Prize Essay for the year 1900. By F. R. Cowper Reed. London: C. J. Clay & Sons, 1901. Size 9 × 6, pp. viii. and 104. *Map and Diagrams. Presented by the Author.*

This was noticed in the Monthly Record for August (*ante*, p. 209).

ASIA.

China. *Questions Dipl. et Colon.* **11** (1901): 663–673. **Fauvel.**
Les voies navigables de la Chine. Par A. A. Fauvel. *With Map.*

China. **Levasseur.**
Chine et Europe. Par E. Levasseur. (From 'Les Entretiens économiques et financiers,' V. Année No. 87, 4 Juin 1901.) Size 13 × 10, pp. 813–816.

China. *B. Comité l'Asie Française* **1** (1901): 59–65. **Madrolle.**
Le Kouang-tchéou-ouan: sa zone d'action. Par A. Madrolle. *With Map.*

On the French concession in Southern China.

China. *B.S.G. Com. Paris* **23** (1901): 92–118. **Vissière.**
Une visite à l'ancienne capitale du Manzi (Chine méridionale). Par A. Vissière. *With Sketch-map.*

On a journey from Shanghai to Hang-chau by water, and back by the Tien-mu mountains.

China. *Army Medical Dep. Rep.*, 1899, **41** (1901): 502–515. ———

Records of temperature, barometer, and rainfall, Lui Kung Tao, Wei-Hai-Wei, from August 10th, 1898, to August 9th, 1899.

China—Ichang. **Holland.**

Trade of Ichang for the year 1900. Foreign Office, Annual No. 2619. 1901. Size 9½ × 6, pp 8. *Price ½d.*

China—Trade. ———

China. Imperial Maritime Customs. I. Statistical Series, Nos. 3 and 4. Returns of Trade and Trade Reports for the year 1900. Part I. Report on the Trade of China, and Abstract of Statistics. Shanghai, 1901. Size 11 × 8½, pp. 40. *Presented by the Inspector-General of Chinese Customs.*

China—Yunnan. *B.S.G. Com. Paris* **23** (1901): 142–154. **Leclère.**

Ressources minières du Yunnan. Par A. Leclère.

Dutch East Indies. **Colenbrander.**

Dagh-Register gehouden in Casteel Batavia van passerende daer ter plaetse als over geheel Nederlandts-India. Anno 1637. (Pp. viii. and 306.) Ditto. Anno 1641–1642. Mitgegeven door het Departement van Koloniën onder toezicht van Dr. H. T. Colenbrander. 'S-Gravenhage, M. Nijhoff, 1899–1900. Size 11 × 7½, pp. vi. and 324.

Dutch East Indies. ———

Register op de eerste 50 Deelen (1853–1899) van de "Bijdragen tot de Taal-, Land-, en volkenkunde Van Nederlandsch-Indië," uitgegeven door het Koninklijk Instituut voor de Taal-, Land-, en volkenkunde van Ned.-Indië, ter gelegenheid van zijn 50-jarig bestaan op 4 Juni 1901. 'S-Gravenhage, M. Nijhoff, 1901. Size 10 × 6½, pp. xx. and 120.

French Indo-China. **Tremlett.**

Trade of French Indo-China for the year 1900. Foreign Office, Annual No. 2618. 1901. Size 9½ × 6, pp. 26. *Price 2d.*

India. *B.S.G. Com. Paris* **22** (1900): 535–546. **Klobukowski.**

Le Kachemire, les provinces du Nord-Ouest et d'Oudh, le Punjab. Par M. Klobukowski.

India. *J. Asiatic S. Bengal* **69** (Pt. ii.) (1900): 457–476. **Rogers.**

The Relationship of the Water-Supply, Water-Logging, and the distribution of *Anopheles* Mosquitos respectively, to the prevalence of Malaria north of Calcutta. By Leonard Rogers.

The result of researches near Calcutta has been to show that prevalence of malaria does not necessarily characterize water-logged areas, even where malaria-bearing mosquitoes abound, but that a pure water-supply is an important prophylactic.

India. ———

Area and Yield of Certain Crops from 1891–92 to 1899–1900. Calcutta, 1900. Size 13½ × 8½, pp. 28.

India. *Scottish G. Mag.* **17** (1901): 225–239. **Holdich.**

Railway Connection with India. By Sir Thomas H. Holdich.

India. ———

Report on the Kodaikanal and Madras Observatories for 1899–1900. Size 13½ × 8½, pp. 18.

India—Assam. ———

Report on Tea Culture in Assam for the year 1899. Shillong, 1900. Size 13 × 8, pp. 8. *Map.*

The year 1899 was particularly favourable for tea, and the outturn showed an increase of 16·7 per cent.

India—Burma. *Scottish G. Mag.* **17** (1901): 239–265. **Cadell.**

A Sail down the Irrawaddy. By Henry M. Cadell. *With Illustrations.*

India—Historical. *J.S. Arts* **49** (1901): 417–431. **Holdich.**

The Greek Retreat from India. By Colonel Sir T. H. Holdich, C.B., etc. *Map.*

Sir T. Holdich examines Arrian's account of Alexander's retreat from India to Persia, in the light of modern knowledge of Southern Baluchistan.

India—Historical. *J. United Service I. India* **30** (1901): 93–116. **Burton.**
The Last Maratha War. By Captain R. G. Burton. *Map, Plan, and Illustration.*

India—Historical. **M'Crindle.**
Ancient India as described in Classical Literature. Being a collection of Greek and Latin Texts relating to India, extracted from Herodotus, Strabo, Diodorus Siculus, Pliny, Ælian, Philostratus, Dion Chrysostom, Porphyry, Stobaeus, the Itinerary of Alexander the Great, the Periêgêsis of Dionysius, the Dionysiaka of Nonnus, the Romance History of Alexander, and other works. Translated and copiously annotated by J. W. M'Crindle, M.A., LL.D. With Introduction and Copious Index. London: A Constable & Co., 1901. Size 9 × 6, pp. xxii. and 226. *Price 7s. 6d. net. Presented by the Publishers.*

This will be noticed elsewhere in the *Journal.*

India—Kashmir. *P. Zoolog. S.* (1901) I.: 91–94. **Lydekker.**
Note on the Kashmir Ibex (*Capra sibirica sacin*). By R. Lydekker. *With Plate.*

India—Languages. ——
Census of India, 1901. Indexes of Languages. London: Printed by Eyre & Spottiswoode, 1901. Size 9½ × 6, pp. 106.

These indexes, which are both alphabetical and classified, are based on the preliminary results of the Linguistic Survey of India.

India—Madras. *Mem. Geolog. Surv. India* **30** (1900): 103–168. **Holland.**
Geology of the neighbourhood of Salem, Madras Presidency, with special reference to Leschenault de la Tour's observations. By Thomas H. Holland. *With Map and Plate.*

An appendix gives extracts from papers by Leschenault de la Tour on geological observations made during his travels (1816–20).

India—Madras. *Indian Antiquary* **29** (1900): 347–350, 378–382. **Temple.**
Some original Documents relating to the taking of Madras in 1746 by La Bourdonnais. By R. C. Temple.

India—Madras. ——
Report on the Administration of the Madras Presidency during the year 1899–1900. Madras, 1900. Size 13½ × 8½, pp. xvi., 44, 242, and ccxiv. *Maps and Diagrams.*

Includes statistical returns on trade, industries, agriculture, etc., etc.

India—Marine Survey. ——
Administration Report of the Marine Survey of India for the official year 1899–1900. Bombay, 1901. Size 13½ × 8½, pp. 4. *Presented by the Survey.*

Among the operations of the year was the running of a meridian distance between Port Blair and Diamond Island, which, in conjunction with two previously run, prove Port Blair to be 1¼ miles east of the hitherto accepted position.

India—N.-W. Provinces and Oudh. ——
Report on the Administration of the N.-W. Provinces and Oudh for the year ending 31st March, 1900. Allahabad, 1901. Size 13½ × 8½, pp. iv., xliv., 206, iv., and 200.

Indo-China. *B. Comité l'Asie Française* **1** (1901): 52–56. **Mourey.**
Les chemins de fer de l'Indo-Chine. Par Charles Mourey. *With Map.*

Japan. **Lay**
Trade of Japan for the year 1900. Foreign Office, Annual No. 2595, 1901. Size 10 × 6, pp. 42. *Price 2½d.*

Japan. *B.S.G. Com. Havre* **17** (1900): 219–240. **Siegfried.**
Le développement économique et social du Japon. Par M. André Siegfried.

Japan—Formosa. **Yamasaki.**
Ein Besuch in den Kopfjägerdörfern auf Formosa. Von Dr. N. Yamasaki. (Sonderabdruck aus Band xxxi. [der Dritten Folge Band I.] der "Mittheilungen der Anthropologischen Gesellschaft in Wien"). Wien, 1901. Size 11½ × 8, pp. 23–38. *Illustrations. Presented by the Author.*

Malay Archipelago—Celebes. *Globus* **80** (1901): 5–6. **Kobelt.**
Die zoogeographische Stellung von Celebes. Von Dr. W. Kobelt. *Sketch-maps.*

Malay Archipelago—Nias. **Van der Kemp.**
Bijd. Taal-, Land- en Volkenk. Nederland.-Indië **8** (1901): 584–603.
Raffles' betrekkingen met Nias in 1820–1821. Door P. H. van der Kemp.

Malay Peninsula—Malacca. **Schmidt.**
Bijd. Taal-, Land- en Volkenk. Nederland.-Indië **8** (1901): 399–583.
Die Sprachen der Sakei und Semang auf Malacca und ihr Verhältnis zu den Mon-Khmēr-Sprachen. Door P. W. Schmidt.

Malay States. **Swettenham.**
Annual Report for the year 1899 on the Federated Malay States. By the Resident-General (Sir F. A. Swettenham, K.C.M.G.), Kuala Lumpur, 1900. Size 13½ × 8½, pp. 6.

The revenue rose from 9 million dollars in 1898 to 13 million in 1899, mainly owing to the high price of tin.

Northern and Central Asia. *Quarterly J. Geolog. S.* **57** (1901): 244–250. **Wright.**
Recent Geological changes in Northern and Central Asia. By Prof. G. F. Wright.

A note on this paper appears elsewhere in the *Journal* (*ante*, p. 212).

Persia. *P.R. Artillery I.* **27** (1901): 683–690. **Wyatt.**
The Western Glacis of India. By Captain F. O. Wyatt. *With Map.*

Continuation of a narrative commenced early last year. The present instalment deals with the journey from Duruksh in the Kain district to Kerman.

Philippine Islands. **Coronas.**
Observatorio de Manila. El Baguio del 8 de Septiembre, 1900. Por el P. José Coronas, S.J. Manila, 1900. Size 12½ × 9, pp. 36. *Diagrams.*

This typhoon was the most violent that had occurred since 1896.

Russia—Caucasus. *Die Natur* **50** (1901): 220–222, 229–231. **Rossmässler.**
Die Volksstämme Kaukasiens. Von F. A. Rossmässler.

Russia—Sakhalin. *B.S.G. Com. Paris* **23** (1901): 119–125. **Labbé.**
L'ile de Sakhaline. Par Paul Labbé.

On a mission carried out for the French Ministry of Public Instruction.

Russia—Siberia. **Bogdanovich and Diener.**
Sitzb. A.W. Wien **109** (Ab. I.), (1900): 349–369.
Ein Beitrag zur Geologie der Westküste des Ochotskischen Meeres. Von K. Bogdanowitsch und C. Diener. *With Plate.*

Russia—Siberia. *B.S.G. Com. Paris* **22** (1900): 281–293. **Aulagnon.**
La Sibérie occidentale et centrale. Par M. C. Aulagnon. *With Map.*

Gives the results of a study on the spot of economic conditions in Western and Central Siberia.

Russia and Persia. *B.S.G. Com. Paris* **22** (1900): 245–266. **Grillières.**
Voyage en Russie et en Perse, partie anecdotique et pittoresque. Par M. le Lieut. Grillières. *With Illustrations.*

The route led *viâ* Askabad and Meshed to Teheran.

Turkey—Aleppo. **Barnham.**
Trade of Vilayet of Aleppo for the year 1900. Foreign Office, Annual No. 2587, 1901. Size 9½ × 6, pp. 18. *Price* 1½*d.*

Turkey—Asia Minor. *J. Anthrop. I.* **30** (1900): 305–320. **Crowfoot.**
Survivals among the Kappadokian Kizilbash (Bektash). By J. W. Crowfoot. *With Map and Plates.*

The writer paid visits in 1900 to some little-known Kizilbash villages near the eastern bank of the Halys.

Turkey—Palestine. **Dickson.**
Trade of Palestine for the year 1900. Foreign Office, Annual No. 2584, 1801. Size 9½ × 6, pp. 10. *Price* 1*d.*

Turkey—Palestine. **Reynolds-Ball.**
Jerusalem. A practical guide to Jerusalem and its Environs, with excursions to Bethlehem, Hebron, Jericho, the Dead sea, and the Jordan, Nablous, Nazareth,

Beirût, Baalbek, Damascus, etc. By E. A. Reynolds-Ball, B.A. London: A. & C. Black, 1901. Size 7 × 4½, pp. viii. and 230. *Plan, Maps, and Illustrations. Price* 2*s.* 6*d. Presented by the Publishers.*

This guide, by the author of 'Cairo of To-day,' should prove of much value to travellers in the Holy Land. It is well arranged, and contains a large amount of practical information.

Turkey—Palestine—Ancient Map. **Beazley.**

Madaba map. By C. Raymond Beazley. (From the *Geographical Journal* for May, 1901.) Size 10 × 6¼, pp. 6.

Turkey—Railway. *Deutsche Rundschau G.* **23** (1901): 337–342. **Hermann.**

Die beschränkte Bedeutung der Bagdadbahn und ihre Gefahr. Von Dr. R. Hermann. *With Map.*

Turkey—Railway. *B. Comité l'Asie Française* 1 (1901): 23–28. **Peyerimhoff.**

Le Chemin de fer de Bagdad. Par M. Henri de Peyerimhoff. *With Map.*

A useful summary of railway projects in Asiatic Turkey.

Turkey—Trebizond and Sivas. **Longworth and Anderson.**

Trade of the Vilayets of Trebizond and Sivas for the year 1900. Foreign Office, Annual No. 2588, 1901. Size 9½ × 6, pp. 38. *Price* 2½*d.*

AFRICA.

Ascension Island. *Nautical Mag.* **70** (1901): 339–350. **Lord.**

Ascension Island. By W. B. Lord.

Ashanti. **Armitage and Montanaro.**

The Ashanti Campaign of 1900. By Captain C. H. Armitage and Lieut.-Colonel A. F. Montanaro. London: Sands & Co., 1901. Size 9 × 6, pp. viii. and 278. *Map, Plan, and Illustrations. Price* 7*s.* 6*d. Presented by the Publishers.*

This is the fullest and in many ways the best account which has appeared of the recent Ashanti campaign. The map, by Stanford, is on the scale of 4 miles to the inch, and permits most of the operations to be followed with ease.

Azores. *Ann. Hydrographie* **29** (1901): 243–253. ———

Die Noth- und Orderhäfen der Azoren. Nach Berichten der Kaiserlichen Konsulate daselbst, des Kommandos S.M.S. *Moltke* und des Kapt. F. W. Thöm, Schiff *Ostara*, ergänzt aus deutschen, englischen und portugiesischen Quellen. *Plans.*

Azores—Cartography. *B.S.G. Lisboa* **17** (1898–99): 455–477. **Mees.**

Les Açores d'après les Portulans. Pelo dr. Jules Mees.

An interesting study of the development of the cartography of the Azores during the middle ages.

Basutoland. *J.R. Colonial I.* **32** (1901): 452–480. **Lagden.**

Basutoland and the Basutos. By Sir Godfrey Lagden, K.C.M.G.

British Central Africa. **Vyvyan.**

Précis of Information concerning the British Central Africa Protectorate, with Notes on Adjoining Territories. Compiled by Major C. B. Vyvyan, February, 1899. London: Eyre & Spottiswoode, 1899. Size 9¾ × 6, pp. 54. *Maps. Price* 3*s.* 6*d. Presented by the Intelligence Division, War Office.*

British South Africa. **Gibbons and Quicke.**

Explorations in Marotseland and Neighbouring Regions. By Major A. St. Hill Gibbons. Supplementary Journeys, by Captain F. C. Quicke. (From the *Geographical Journal* for February, 1901). Size 10 × 6½, pp. 30. *Maps and Illustrations.*

British South Africa. **Grey.**

The Kafue River and its Headwaters. By George Grey. (From the *Geographical Journal* for July, 1901). Size 10 × 6½, pp. 16. *Map.*

Central Africa. *P. Zoolog. S.* (1901) I.: 50–52. **Sclater.**

On an apparently new Species of Zebra from the Semliki Forest. By P. L. Sclater, F.R.S. *With Illustrations.*

This account of the new mammal brought to light by Sir H. Johnston, is based on the fragments of skin first procured.

East Africa. *J. Anthrop. I.* **30** (1900): 275–297. **Hollis.**
Notes on the History of Vumba, East Africa. By A. C. Hollis. *With Maps.*

The author has written down the traditions and folk-lore of the Vumba district on the southern border of British East Africa, from the accounts of aged inhabitants. Many important documents on the history of the place in early Arab times were destroyed during the rebellion of Mbaruk in 1895.

Egypt. **Brodrick.**
A Handbook for Travellers in Lower and Upper Egypt, including descriptions of the course of the Nile through Egypt and Nubia, Alexandria, Cairo, the Pyramids, Thebes, the First and Second Cataracts to Khartûm, the Suez Canal, the Peninsula of Mount Sinai, the Oases, the Fayyûm, etc. Tenth edition, revised. Edited by Mary Brodrick, PH.D. London: John Murray, 1900. Size 7 × 4½, pp. 16 and 1006. *Maps and Plans. Price* 15*s. Presented by the Publisher.*

The ninth edition, which appeared in 1891, and was itself entirely rewritten, has now been carefully revised and brought up to date.

Egypt. **Cromer.**
Egypt. No. 1 (1901). Reports by His Majesty's Agent and Consul-General on the Finances, Administration, and Condition of Egypt and the Soudan in 1900. London: Eyre & Spottiswoode, 1901. Size 13 × 8½, pp. iv. and 86. *Price* 9*d.*

This report will be specially noticed.

Egypt. *Cosmos* **13** (1901): 40–44. **Nallino.**
La Descrizione dell' Egitto di 'Umar ibn Muhammad al-Kindî, pubblicata da J. Oestrup. Cenni critici del Prof. dott. C. A. Nallino.

Dr. Oestrup published a version of the description of Egypt by Ibn Muhammad al-Kindi (tenth century) in 1896 at Copenhagen.

Egypt. ——
Ministry of Public Works. A List of Publications, Maps, and Plans published by the Public Works Ministry up to December 31, 1900. Cairo, 1901. Size 9½ × 6½, pp. 22.

Egypt—Farafra Oasis. **Beadnell.**
Survey Department, Public Works Ministry. Geological Survey Report, 1899. Part iii. Farafra Oasis: its Topography and Geology. By Hugh J. L. Beadnell, Cairo, 1901. Size 11 × 7½, pp. 40. *Maps and Sections.*

Egypt—Sinai. *Geolog. Mag.* **8** (1901): 198–204. **Hume.**
The Rift Valleys of Eastern Sinai. Geology of Eastern Sinai. By W. F. Hume, D.SC.

A note on this paper has appeared in the Monthly Record (*ante*, p. 211).

Egypt—Sudan. **Dujarric.**
Gaston Dujarric. L'État Mahdiste du Soudan. Préface par Henri Pensa. Paris: J. Maisonneuve, 1901. Size 9 × 5½, pp. iv. and 314. *Price* 6*s.* 6*d.*

A historical sketch of the rise and fall of the Mahdist power. The writer attempts in a measured way to vindicate the character of the Khalifa, and his anti-English sympathies are now and then apparent, as when he attributes the picture drawn by Slatin of the Khalifa's rule to the pressure of the Intelligence Department.

Egyptian Sudan. *Verh. Ges. Erdk. Berlin* **28** (1901): 217–225. **Linck.**
Bericht über seine Reise nach Kordofan. Von Prof. Dr. G. Linck. *With Map.*

The writer accompanied Slatin Pasha on a recent visit to Kordofan.

French Congo. *Rev. Française* **26** (1901): 321–335. **Gentil.**
La Conquête du Tchad: Mission Congo-Chari. Par M. Gentil. *With Map.*

French Congo. *Deutsch. Kolonialzeitung* **18** (1901): 185–186. **Kannengiesser.**
Die Verwaltung des Schari-Gebietes. Von G. A. Kannengiesser. *With Map.*

French Congo. *B.S.G. Com. Paris* **22** (1900): 271–293. **Montrozier.**
Les Sultanats de M'Bomou. Par M. R. Cobrat de Montrozier.

French Congo—Ogowe. *B.S.G. Com. Paris* **23** (1901): 126–141. **Avelot.**
Dans la boucle de l'Ogooué. Par René Avelot. *With Map.*

Account of surveys executed in 1899 in the southern Ogowe basin.

French West Africa. *B. Comité l'Afrique Française* 11 (1901): 184–197. **Joalland.**
Les missions du Chari et de l'Afrique Centrale. La mission Joalland-Meynier. *With Map and Portraits.*

French West Africa. *Rev. Française* 26 (1901): 335–351. **Joalland.**
De Zinder au Tchad: Mission Afrique centrale. Par P. Joalland.

French West Africa. *B. Comité l'Afrique Française* 11 (1901): 178–181. **Terrier.**
Le territoire militaire de Zinder et la Convention de 1898. Par M. Auguste Terrier.

Urges the necessity, from the French point of view, of a rectification of the frontier between British Nigeria and the French Sahara.

French West Africa. *La G., B.S.G. Paris* 3 (1901): 353–368. **Gentil.**
Occupation et organisation des territoires du Tchad. Par M. Gentil.

French West Africa. *La G., B.S.G. Paris* 3 (1901): 369–380. **Joalland.**
De Zinder au Tchad et conquête du Kanem par le Capitaine P. Joalland.

German Colonies. *Rev. Française* 26 (1901): 269–280. **Vasco.**
Les Colonies Allemandes d'Afrique. Par G. Vasco. *With Map.*

German East Africa. *M. Deutsch. Schutzgeb.* 14 (1901): 114–124. **Kandt.**
Bericht des Forschungsreisenden Dr. Kandt aus Ruanda.

A note on Dr. Kandt's latest journeys appears in the Monthly Record.

German East Africa. *M. Deutsch. Schutzgeb.* 14 (1901): 106–113. **Prüssing.**
Ueber das Rufiyi-Delta. Von Kapitän Prüssing. *With Map.*

A note on this paper will appear elsewhere.

German East Africa. *Deutsch. Kolonialblatt* 12 (1901): 441–444. ——
Grenzreise des Stationschefs von Iringa. *With Map.*

On a journey made early in 1901 round the borders of the Iringa district (Uhehe).

German South-West Africa. *M. Deutsch. Schutzgeb.* 14 (1901): 91–105. **Görgens.**
Das Landvermessungs- und Fortschreibungssystem der Kapkolonie und seine modifizirte Anwendung in Deutsch-Südwestafrika. Nach einem Bericht von Regierungslandmesser H. Görgens.

German South-West Africa. *Deutsch. Kolonialblatt* 12 (1901): 317–318. ——
Vegetationsverhältnisse in Swakopmund.

This is referred to in the Monthly Record (*ante*, p. 90).

Ivory Coast. *Globus* 79 (1901): 313–318. **Singer.**
Woelffels Reisen im Hinterlande der Elfenbeinküste. Von — Singer. *With Map and Illustrations.*

Kamerun. *Sitzb. A. W. Berlin* (1901): 277–299, 400–417. **Esch.**
Der Vulcan Etinde in Kamerun und seine Gesteine. Von Dr. E. Esch. *With Illustrations.*

Kamerun. **Dominik.**
Kamerun. Sechs Kriegs- und Friedensjahre in deutschen Tropen. Von Hans Dominik. Berlin: E. S. Mittler & Sohn, 1901. Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. viii. and 316. *Map and Illustrations. Price 9s. 9d.*

This is noticed with other African books in the present number of the *Journal.*

Kamerun. *Deutsch. Kolonialblatt* 12 (1901): 275–278. **Puttkamer.**
Expedition des Gouverneurs nach den Crossschnellen. *With Map.*

The return route from the Cross river was to a large extent the same as that followed by Ramsay (see below).

Kamerun. *Deutsch. Kolonialblatt* 12 (1901): 234–238. **Ramsay.**
Expedition des Generalbevollmächtigten der Gesellschaft Nordwest-Kamerun.

From a report by Captain Ramsay on a journey in the upper basin of the Cross river, an important hitherto unknown tributary of which was discovered.

Madagascar—Surveys. *Rev. G.* **48** (1901): 508–513. ——

Aperçu général sur les travaux Géographiques exécutés à Madagascar, d'après les documents officiels.

Marocco. *La G., B.S.G. Paris* **3** (1901): 381–390. **Weisgerber.**

Itinéraire de Salé à Tanger. Par Dr. F. Weisgerber. *Map and Illustrations.*

Marocco. *Questions Dipl. et Colon.* **12** (1901): 1–13. **Caix.**

L'Angleterre et la question du Maroc. Par Robert de Caix. *With Map.*

Masai Language. **Hinde.**

The Masai Language. Grammatical Notes together with a vocabulary. Compiled by H. Hinde. Cambridge: The University Press, 1901. Size $7\frac{1}{2} \times 5$, pp. x. and 76. *Presented by the Publishers.*

This is virtually the first attempt which has been made to reduce the complicated Masai language to grammatical rule. Mrs. Hinde's method consisted in framing a number of sentences after the same model and obtaining the Masai equivalents, any feature maintained throughout being taken to supply the required rule. The authoress takes exception to both Erhardt's and Sir Harry Johnston's method of writing Masai. As to the pronunciation of the name, she says the stress is decidedly on the first syllable, and that the *s* is soft.

Niger. *B. Comité l'Afrique Française* **11** (1901): 221–223. **Terrier.**

La flottille du Bas-Niger à Say. Par M. Auguste Terrier. *With Maps.*

On the French Niger Expedition under Captain Lenfant. The maps show the position of the French *enclaves.*

Nile—Fauna. *P. Zoolog. S.* (1900): 950–973. **Flower.**

Notes on the Fauna of the White Nile and its Tributaries. By Captain Stanley Smyth Flower.

North-East Africa. *Verh. Ges. Erdk. Berlin* **28** (1901): 240–248. **Erlanger.**

Ueber die Reise von Carlo Frhr. v. Erlanger in den Galla-Ländern. *With Map.*

See note, *ante*, p. 214.

North-East Africa. *P. Zoolog. S.* (1900): 800–807. **Thomas.**

List of Mammals obtained by Dr. Donaldson Smith during his recent Journey from Lake Rudolf to the Upper Nile. By Oldfield Thomas.

Sahara. *B.S.G. Lille* **35** (1901): 347–370. **Foureau.**

De l'Algérie au Congo par l'Aïr et le Tchad. Par Fernand Foureau. *With Portrait and Map.*

Sahara. *C. Rd.* **132** (1901): 388–392. **Lapparent.**

Sur la découverte d'un Oursin d'âge crétacé dans le Sahara oriental. Par M. A. de Lapparent. Size $11 \times 8\frac{1}{2}$, pp. 6. *Also separate copy, presented by the Author.*

See note in Monthly Record (*ante*, p. 88).

Sahara. **Sommerville.**

Sands of Sahara. By Maxwell Sommerville. Philadelphia: J. B. Lippincott Co., 1901. Size $8\frac{1}{2} \times 6$, pp. 162. *Illustrations. Price* 10*s.* 6*d. Presented by the Author.*

Notes of travel, popular in character.

Sahara. *Rev. G. Int.* **25** (1901): 193–214. **Foureau and Lamy.**

Mission Foureau-Lamy.

Sahara—Adrar. *B.S.G. Com. Paris* **22** (1900): 267–280. **Jouinot-Gambetta.**

La mission Blanchet dans l'Adrar. Par M. le Lt. Jouinot-Gambetta. *Illustrations.*

Sierra Leone. **Gore.**

Sierra Leone. Report for 1900. Colonial Reports, Annual No. 324, 1901. Size $9\frac{1}{2} \times 6$, pp. 40. *Price* 2½*d.*

South Africa. **Bleloch.**

The New South Africa, its Value and Development. By W. Bleloch. London: W. Heinemann, 1901. Size 9×6, pp. xvi. and 436. *Maps and Diagrams. Price* 10*s.*

A careful study of the resources of South Africa, and of the work which lies before the British Administration in the New Colonies. The writer champions the Uitlanders as a hard-working, sober, and enterprising set of men, among whom, though little luxury is to be found, all the decencies and many of the elevating influences of life are observed and cultivated. As regards the native question, he deprecates the idea of equality between white and black, which cannot exist without fusion between the races, which is certainly not wanted. If somewhat optimistic, the book is evidently the outcome of a thoughtful consideration of the problems awaiting solution.

South Africa. **Reclus.**

Elisée Reclus. L'Afrique Australe. Mise a jour par Onésime Reclus. Paris, 1901. Size 9 × 7, pp. 358. *Maps. Price* 10*s.*

A very full and carefully compiled account of our present knowledge of South Africa.

South Africa. *Quarterly Rev.* **193** (1901): 224–257, 544–583. ——

The Settlement of South Africa.

An examination of the resources of South Africa and other points bearing on its future development.

South Africa—Native Races. ——

The Natives of South Africa, their Economic and Social Condition. Edited by the South African Native Races Committee. London: John Murray, 1901. Size 9 × 6, pp. xiv. and 360. *Maps. Price* 12*s. net. Presented by the Publisher.*

The investigations set on foot in 1899 by the Native Races Committee, with a view to throwing trustworthy light on the native question in South Africa, seem to have been carried out with thoroughness, and in an impartial spirit. The results, set forth in this volume, should be of much value to all interested in the future of South Africa. In the summary and conclusions contained in chapter xv., the necessity of considering, not merely the welfare of the natives, but their claims to form part of the future commonwealth, is insisted on.

South Central Africa. **Reid.**

Journeys in the Linyanti Region. By Percy C. Reid. (From the *Geographical Journal* for June, 1901.) Size 10 × 6½, pp. 16. *Map and Illustrations.*

Togo. *M. Deutsch. Schutzgeb.* **14** (1901): 74–76. **Preil.**

Höhenmessungen von Bergassessor a. D. Fr. Hupfeld auf der Douglasschen Togo-Expedition. Berechnet von Oberleutnant Preil.

Höhenmessungen im Hinterlande von Togo. Berechnet von Oberleutnant Preil.

Togo. *Globus* **79** (1901): 217–220. **Seidel.**

Togo im Jahre 1900. Von H. Seidel.

Togo. *Deutsch. Kolonialblatt* **12** (1901): 238–239, 278–282, 314–316. ——

Ueber die Verhältnisse im Bezirk Misahöhe.

Transvaal. *B.S.G. Com. Paris* **22** (1900): 505–534. **Léon.**

La Transvaal, causerie par M. S. Léon.

Tristan da Cunha. *Nautical Mag.* **70** (1901): 208–218. **Lord.**

Tristan da Cunha. By W. B. Lord.

Sketch of the history of Tristan da Cunha, and of various shipwrecks in its vicinity.

Uganda. **Johnston.**

Africa. No. 7 (1901). Report by His Majesty's Special Commissioner on the Protectorate of Uganda. London: Eyre & Spottiswoode, 1901. Size 13½ × 8½, pp. 26. *Map. Price* 9*d.*

This is noticed in the Monthly Record (*ante*, p. 309).

NORTH AMERICA.

Alaska. *B.S.G. Com. Havre* **17** (1900): 241–247; **18** (1901): 300–310. **Vallois.**

Trois mois au cap Nôme (Alaska). Par M. Paul Vallois.

Alaska. —

Explorations in Alaska in 1898.—Twentieth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1898–99. Part vii. Washington, 1900. Size 11½ × 8, pp. 510. *Maps and Illustrations. Presented by the U.S. Geological Survey.*

This will be noticed with other reports on Alaskan Exploration.

Alaska and N.W. Canada. *Mazama* **2** (1901): 75–82. **Davidson.**

Explanation of an Indian Map of the Rivers, Lakes, Trails, and Mountains from the Chilkaht to the Yukon drawn by the Chilkaht chief, Kohklux, in 1869. By George Davidson, PH.D. *With Map.*

Canada. **Lucas.**

A Historical Geography of the British Colonies. By C. P. Lucas, C.B. Vol. v. Canada—Part i. (New France). Oxford: the Clarendon Press, 1901. Size 7½ × 5, pp. 364. *Maps. Price* 6*s. Presented by the Clarendon Press.*

The new volume of Mr. Lucas' well-known work fully sustains the character of its predecessors. It deals with the history of France and Great Britain in Canada and adjacent parts of North America down to 1763, and presents incidentally a useful sketch of the progress of geographical discovery in North America in the sixteenth and seventeenth centuries. As usual, the author is at pains to elucidate the reasons for the course taken by the historical events.

Canada. *Climate* **2** (1901): 112–120. **Newnham.**

From Churchill to York on Snowshoes. By the Right Rev. Bishop Newnham, D.D. *With Illustrations.*

Account of a winter journey, during which temperatures reaching to 43° below zero Fahr. were experienced.

Canada. *T. Hist. and Sci. S. Manitoba,* No. 57 (1901): pp. 16. **Bryce.**

Early Red River Culture. By Mrs. George Bryce. *With Illustrations.*

Culture, in reference to the Red river, is understood by the author in a comparative sense only, as "Something analogous to making the best of one's self under difficult circumstances."

Canada. *J.R. Colonial I.* **32** (1901): 399–403. **McDougall.**

North-Western Canada. By the Rev. John McDougall.

Canada. *P. and T. Nova Scotian I. Sci.* **10** (1900): 303–318. **MacKay.**

Phenological Observations, Canada, 1899. By A. H. MacKay, LL.D. *Diagram.*

Canada. *T. Hist. and Sci. S. Manitoba,* No. 58 (1901): pp. 8. **McLean.**

Notes and Observations of Travels on the Athabasca and Slave Lake Regions in 1899. By W. J. McLean.

Canada. *Imperial I. J.* **7** (1901): 126–129. **Strathcona.**

Canada and the Empire. By the Rt. Hon. the Lord Strathcona and Mount Royal, G.C.M.G.

Canada. —

Annual Report of the Department of the Interior for the year 1900. Ottawa, 1900. Size 10 × 6½, pp. viii., xxxviii., 120, 188, 48, 16, 16, 8, 6, 16. *Map and Illustrations.*

As usual, this report contains a large amount of valuable information on Canad[ian] surveys, mineral and other resources, immigration, etc. (cf. *ante*, p. 312).

Canada. —

Tide Tables for Charlottetown, Pictou, and St. Paul Island, C.B., for 1901. Wi[th] Tidal Differences for Northumberland Strait; and for the open Gulf shore, fr[om] Miramichi along the north coast of Prince Edward Island. Ottawa, 1900. S[ize] 10 × 6½, pp. 12.

Canada. —

Tide Tables for Halifax, Quebec, St. John, N.B., and St. Paul Island, fo[r the] year 1901, with Tidal Differences for the Atlantic Coast of Nova Scotia, th[e St.] Lawrence River and Gulf, and the Bay of Fundy. Reprinted from *Greenw[ich] Nautical Almanac and Tide Tables for* 1901. Size 8½ × 7, pp. 12

Canada—Historical. **Wrong and Langton.**

University of Toronto Studies. History, First Series, Vol. 5. Review of Historical Publications relating to Canada for the year 1900. Edited by Prof. George M. Wrong and H. H. Langton. Toronto, 1901. Size 10½ × 7, pp. xii. and 226. *Presented by the University of Toronto.*

Canada—Historical. *T. Hist. and Sci. S. Manitoba*, No. 59 (1901): pp. 16. **Jonasson.**

The Early Icelandic Settlements in Canada. By Mr. Sigtr. Jonasson.

Canada—Hudson Bay. **Campbell.**

The Father of St. Kilda. Twenty Years in Isolation in the Sub-Arctic Territory of the Hudson's Bay Company. By Roderick Campbell. London: W. R. Russell & Co., 1901. Size 8 × 5, pp. xvi. and 328. *Portrait. Presented by the Author.*

The author, whose early years were spent in the remotest parish of the island of Lewis, gives in this work a personal narrative of his adventures, from 1859 onwards, in the lands around Hudson bay. The book gives a vivid idea of the condition of life in those regions half a century ago.

Canada—Indians. ——

Canada. Memorandum on the Legal Status of British North American Indians. Colonial Reports, Miscellaneous, No. 15, 1900. Size 9½ × 6, pp. 22. *Price 1½d.*

Contains information as to the Indian reserves in Canada.

Canada North-West Territories. **Garry.**

Diary of Nicholas Garry, Deputy-Governor of the Hudson's Bay Company from 1822–1835. A detailed narrative of his travels in the North-West Territories of British North America in 1821. (From the *Transactions* of the Royal Society of Canada. Second Series, 1900–1901, Vol. vi., Section ii.) Ottowa: J. Hope & Sons, 1900. Size 10 × 6½, pp. 72–204. *Portrait and Illustrations. Price 5s. Presented by Mr. Bernard Quaritch.*

This will be specially noticed.

Canada—Pilot. ——

Supplement, 1901, relating to the St. Lawrence Pilot, Vol. i. [Sixth Edition, 1894.] (Corrected to January, 1901.) London: J. D. Potter, 1901. Size 9½ × 6, pp. 48. *Price 4d.*

Canada—Place-names. ——

Annual Report of the Geographic Board of Canada, 1900. (Supplement to the Thirty-Third Annual Report of the Department of Marine and Fisheries, Marine). Ottawa, 1901. Size 10 × 6½, pp. 46.

Since the date of the last report (*Journal*, vol. xiv. pp. 668) decisions have been arrived at in the case of 1307 names, bringing the total number to 1708. Among the forms adopted are the following: Kicking Horse river (not Wapta); Liard (not Mountain) river; Lewes river (not Lewis); Islands of God's Mercie (Hudson strait: not Middle Savage islands); Abitibi (not Abitibbi); Waddell bay (not Dyer sound); Nottaway river (not Noddawai). The termination of the last is not consistent with the rules.

Canada—Rocky Mountains. *Appalachia* **9** (1901): 289–302. **Scattergood.**

The Beaverfoot Valley and Mount Mollison. By Mr. J. Henry Scattergood. *With Sketch-map and Illustration.*

Canada—Rocky Mountains. *Appalachia* **9** (1901): 314–316. **Vaux.**

The Wapta Fall. By George S. Vaux, jun. *With Illustration.*

This fall, among the mountains north of the Canadian Pacific Railway, is estimated to have a total height of 1050 to 1200 feet.

Mexico. *P.I. Civil Engineers* **143** (1901): 286–295. **Body.**

The Drainage of the Valley of Mexico. By J. B. Body.

A historical sketch of operations for the draining of the valley of Mexico, beginning from 1607.

Mexico. **Magliano.**

Notizie sul Messico in attinenza cogli interessi italiani. Rapporto del conte R. Magliano di Villar San Marco. (Boll. Ministero Affari Esteri, Novembre, 1900.) Roma. Size 9½ × 6½, pp. 30.

On the trade and resources of Mexico.

Mexico—Cacao. **Lemcke.**
Beiträge Kolonialpolitik u. Kolonialwirtschaft **2** (1900–1901): 554–563.
Die Kakao-Kultur in Mexiko. Von Heinrich Lemcke.

Mexico—Rubber. **Lemcke.**
Beiträge Kolonialpolitik u. Kolonialwirtschaft **2** (1900–1901): 481–487.
Die Gummi-Kultur in Mexiko. Von Heinrich Lemcke. *With Illustrations.*

Newfoundland—Historical. **Wagner.**
Découverte et Évolution cartographique de Terre-Neuve, et des pays circonvoisins, 1497–1501–1769. Par H. Harrisse. Von Hermann Wagner. (Sonder-Abdruck aus den Göttingischen gelehrten Anzeigen unter der Aufsicht der Königl. Gesellschaft der wissenschaften, 1901, Nr. 2.) Size 9½ × 7, pp. [8]. *Presented by the Author.*

A review of M. Harrisse's recent work.

North America—Mammals. **Elliot.**
A Synopsis of the Mammals of North America and the Adjacent Seas. By Daniel Giraud Elliot. (Field Columbian Museum, Publication 45. Zoological Series, vol. ii.) Chicago, 1901. Size 10 × 6½, pp. xiv. and 472. *Illustrations.*

United States. **[Wilson.]**
Report of the Secretary of Agriculture, 1900. Washington, 1900. Size 9 × 6, pp. 76.

United States. ———
Annual Report of the Board of Regents of the Smithsonian Institution, showing the operations, expenditures, and condition of the Institution for the year ending June 30, 1897. Report of the U.S. National Museum, Part ii. Washington, 1901. Size 9½ × 6, pp. xii. and 516. *Portraits.*
The same, for the year ending June 30, 1899. Washington, 1901. Pp. xv. and 598.

The first-named volume forms a memorial of George Brown Goode, with selections from his papers.

United States—Colorado. *Alpine J.* **20** (1901): 360–368. **Anderson.**
The Grand Cañon of the Colorado River. By Tempest Anderson. *With Illustrations.*

Account of an excursion carried out in company with Prof. W. M. Davis (see below).

United States—Colorado. **Davis.**
An Excursion to the Grand Cañon of the Colorado. By W. M. Davis. (*Bulletin* of the Museum of Comparative Zoölogy at Harvard College, vol. xxxviii. Geological Series, vol. v. No. 4.) Cambridge, Mass., 1901. Size 9½ × 6, pp. 105–201. *Maps and Illustrations.*

A note on this paper will be given.

United States—Idaho. *Monthly Weather Rev.* **29** (1901): 19–20. **Blandford.**
Some Features of the Climate of Idaho. By S. M. Blandford. *With Diagram.*

United States—Maryland. ———
Maryland Geological Survey. Allegany County. Baltimore: The Johns Hopkins Press, 1900. Size 10½ × 7, pp. 324. *Maps and Illustrations. Presented by the Maryland Geological Survey.*

United States—Naval Observatory. ———
Report of the Superintendent of the United States Naval Observatory for the fiscal year ending June 30, 1900. Washington, 1900. Size 9 × 6, pp. 34. *Presented by the U.S. Naval Observatory.*

United States—North Carolina. **Grave.**
Johns Hopkins University Circulars **20** (1901): 50–53.
The Oyster Reefs of North Carolina: a Geological and Economic Study. By Caswell Grave, PH.D. *With Chart.*

United States—Texas. *B. United States Geolog. Surv.*, No. 164 (1900): 100. **Vaughan.**
Reconnaissance in the Rio Grande Coal Fields of Texas. By Thomas Wayland Vaughan. Including a report on Igneous Rocks from the San Carlos Coalfield. By E. C. E. Lord. *With Maps and Illustrations.*

United States—Utah. *B. United States Geolog. Surv.*, No. 166 (1900): 44. **Gannett.**
A Gazetteer of Utah. By Henry Gannett. *With Map.*

United States—Utah. *Monthly Weather Rev.* **29** (1901): 22–24. **Murdoch and Gilbert.**
Relation of the Water Level of Great Salt Lake to the Precipitation. By L. H. Murdoch. *With Diagram.*
The Water Level of Great Salt Lake. By G. K. Gilbert.

United States—Washington—Mount Rainier. *Mazama* **2** (1901): 93–117. **Piper.**
The Flora of Mount Rainier. By Prof. Chas. V. Piper.

CENTRAL AND SOUTH AMERICA.

Andes. **Olascoaga.**
Topografía Andina. Ferrocarril paralelo á los Andes como fomento de población y Seguridad de la Frontera. Complemento indispensable de la Campaña de 1879. Por el Coronel M. J. Olascoaga, Buenos Aires, 1901. Size $10\frac{1}{2} \times 6\frac{1}{2}$, pp. 132. *Maps.*

A sketch of the geography of the southern Andine provinces of Argentina, with a scheme for a railway from Mendoza to the headwaters of the Neuquen parallel to the Andes.

Argentine Republic. **Hankin.**
Trade of Consular District of Buenos Ayres for the year 1900. Foreign Office, Annual No. 2615, 1901. Size 10×6, pp. 40. *Price* $2\frac{1}{2}$*d.*

Bolivia—Andes. **Conway.**
The Bolivian Andes. A Record of Climbing and Exploration in the Cordillera Real in the years 1898 and 1900. By Sir Martin Conway. London and New York: Harper & Bros., 1901. Size 9×6, pp. x. and 404. *Illustrations. Price* 12*s.* 6*d.* *Presented by the Publishers.*

This will be fully noticed elsewhere in the *Journal.*

Bolivia—Boundary Question. *B.S.G. La Paz* **3** (1901): 101–197. **Iraizós.**
Asuntos Internacionales. I. El Sudeste de Bolivia. Por Francisco Iraizós. *Map. Also separate copy, presented by the Sociedad Geografica de La Paz.*

This is the first of a series of papers to be published by the Geographical Society of La Paz, dealing with questions of frontier between Bolivia and neighbouring states. The present paper is concerned with the frontier with Paraguay, which is claimed to be formed by the Pilcomayo and Paraguay rivers.

Bolivia and Brazil. *B.S.G. La Paz* **3** (1901): 210–219. **Camacho.**
La cuestión internacional del Acre (Conferencia pronunciada en la tercera sesión de la Universidad de La Paz) Por Juan T. Camacho.

Bolivia and Brazil. *B.S.G. La Paz* **2** (1900): 1–12; **3** (1901): 198–204. **Saavedra.**
Los límites con el Brasil y la "cuestión del Acre." Por Bautista Saavedra.

The Acre is a southern tributary of the Purus also called Aquiry, on which the Bolivians state that encroachments have been made from the side of Brazil.

Brazil. **Branner and Gilman.**
The Stone Reef at the mouth of Rio Grande do Norte, Brazil. By J. C. Branner and C. E. Gilman. (From the *American Geologist*, vol. xxiv., December, 1899.) Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. [4].

This reef stretches like a long, low, nearly straight wall across the mouth of the river, giving the idea of a work of art.

Brazil. *B.S.G. Com. Paris* **22** (1900): 315–319. **Néry.**
L'Amazonie brésilienne. Par le baron de Santa Anna Néry.

Brazil—Maranhao. **Temple.**
Report on the State of Maranhão. Foreign Office, Miscellaneous, No. 547, 1901. Size $9\frac{1}{2} \times 6$, pp. 20. *Price* $1\frac{1}{2}$*d.*

A summary of the geography, resources, commerce, etc., of the state.

Brazil—Parana. **Tonissi.**
L'Esploraz. Com. 15 (1900): 201, 209, 252, 273; 16 (1901): 8, 23, 40, 72, 81.
Escursioni nello Stato del Paranà (Brasile). By L. Tonissi. *With Maps.*

Brazil—Pernambuco. **Howard.**
Trade of Consular District of Pernambuco for the year 1900. Foreign Office, Annual No. 2591, 1901. Size 9½ × 6, pp. 32. *Price* 2*d.*

Central America. *B.I. Fis.-G. Costa Rica* 1 (1901): 87–90. **Pittier.**
Un descubrimiento importante para Centro-América. Por Enrique Pittier.

On the recent discovery of a species of *Tabernaemontana* yielding a product similar to guttapercha.

Central America. *G.Z.* 7 (1901): 343–346. **Werth.**
Ueber die geologische Bedeutung der tropischen Vegetationsformationen in Mittelamerika und Südmexiko. Nach Carl Sapper. Von E. Werth.

Chile. **Gormaz.**
Hundimiento o Solevantamiento de los Archipiélagos Australes de Chile. Por Francisco Vidal Gormaz. Santiago de Chile, 1901. Size 10 × 7, pp. 24.

Costa Rica. *B.I. Fis.-G. Costa Rica* 1 (1901): 10–29. **Pittier.**
Primer ensayo de un mapa de la declinación magnética en Costa Rica. Por Enrique Pittier.

Dutch West Indies—Curaçoa. **Jesurun.**
Trade of Curaçoa and its Dependencies for the year 1900. Foreign Office, Annual No. 2594, 1901. Size 9½ × 6, pp. 26. *Price* 2*d.*

Ecuador. *C. Rd.* 132 (1901): 1444–1446. **Gonnessiat.**
Six Mois d'observations météorologiques à Quito. Par M. F. Gonnessiat.

Jamaica. **Olivier.**
Jamaica. Report for 1899–1900. Colonial Reports, Annual No. 317, 1901. Size 9½ × 6, pp. 86. *Price* 4½*d.*

Jamaica. **Roxburgh and Ford.**
The Handbook of Jamaica for 1901, comprising Historical, Statistical, and General Information concerning the Island. Compiled by T. L. Roxburgh and Jos. C. Ford. London: E. Stanford, 1901. Size 9 × 5½, pp. viii. and 560. *Map. Price* 7*s.* 6*d. net. Presented by the Publisher.*

This useful publication has now reached its twenty-first year of issue.

Nicaragua. **Chambers.**
Trade of Nicaragua for the year 1900. Foreign Office, Annual No. 2585, 1901. Size 9½ × 6, pp. 12. *Price* 1*d.*

Nicaragua Canal. *Questions Dipl. et Colon.* 11 (1901): 734–741. **Franklin.**
Le canal de Nicaragua. Par J. H. Franklin.

The writer thinks that the Americans will ultimately recognize the advantages presented by the Panama, as compared with the Nicaragua route.

Patagonia. *Ann. G.* 10 (1901): 232–259. **Gallois.**
Les Andes de Patagonie. Par M. L. Gallois. *With Map and Plates. Also separate copy, presented by the Author.*

The writer here combines the results of all recent investigations into a useful general description of the Patagonian Andes.

Peru. **Reader.**
Peru: its present financial, commercial, and political conditions. [By A. B. Reader.] [1899.] Size 9½ × 6, pp. 34.

Political Geography. *National G. Mag.* 12 (1901): 169–175. **Foster.**
The Latin-American Constitutions and Revolutions. By John W. Foster.

South America. **Garland.**
South American Conflicts and the United States. By Alejandro Garland. Lima, [1900]. Size 10½ × 7½, pp. xxiv. and 14.

On the relations between Chili and Peru arising from the war of 1881–83, and the attempted mediation of the United States during the conflict.

South America. **Keane and Markham.**

Stanford's Compendium of Geography and Travel (New issue). Central and South America. Vol. i. By A. H. Keane. Edited by Sir Clements Markham, K.C.B., F.R.S. London: E. Stanford, 1901. Size 8 × 5½, pp. xxii. and 612. *Maps and Illustrations. Price* 15*s*. *Presented by the Publisher.*

The appearance of a new, entirely re-written edition of 'South America' in this series is particularly welcome, owing to the amount of scientific work done in that continent during the last two decades of the nineteenth century, and the various political questions which have arisen within the last few years. The want of a comprehensive and trustworthy account of South America at the present day has long been felt, and it is satisfactory to feel that it is now in a way to be supplied. The first three chapters give a useful general survey of the physical, ethnical, and political relations of the continent. The work is fully reviewed in the August number of the *Journal*.

Trinidad. *J.R. Colonial I.* **32** (1901): 377–398. **Jerningham.**

Trinidad and its Future Possibilities. By Sir Hubert E. H. Jerningham, K.C.M.G.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Botany. **Banks and Solander.**

Illustrations of the Botany of Captain Cook's Voyage Round the World in H.M.S. *Endeavour*, in 1768–71. By the Right Hon. Sir Joseph Banks and Dr. Daniel Solander, F.R.S. With Determinations by James Britten. Australian Plants. Part ii. London: Longmans & Co., etc., 1901. Size 19½ × 13, pp. 35–75 [142]. *Plates. Presented by the Trustees of the British Museum.*

The first part, published last year, was noticed in vol. xvi. of the *Journal*, p. 254. Several important orders are illustrated in the present instalment.

Fiji. *T. and Ninth Annual Rep. Liverpool G.S.* (1900): 53–71. **Finucane.**

Islands and People of Fiji. By Morgan J. Finucane.

German New Guinea. *M. Deutsch. Schutzgeb.* **14** (1901): 131–138. **Pflüger.**

Einige geologische Bemerkungen über den Bismarck-Archipel. Von Privatdozent Dr. Pflüger.

German New Guinea. *Deutsch. Kolonialblatt* **12** (1901): 282–283. **Bennigsen.**

Reise des Gouverneurs nach dem Süden von Deutsch-Neu-Guinea.

New South Wales. **Bonwick.**

Captain Cook in New South Wales, or the Mystery of naming Botany Bay. By James Bonwick. London: Low & Co., 1901. Size 8½ × 5½, pp. 32.

A criticism of Hawkesworth's account of Cook's first voyage. The writer thinks that Hawkesworth had access to no original log or journal of Cook's.

New South Wales. ———

New South Wales. Statistical Register for 1899 and previous years. Sydney, 1900. Size 10 × 6½, pp. viii. and 1014. *Presented by the Agent-General for New South Wales.*

Pacific—Ethnology. **Brigham.**

Occasional Papers of the Bernice Pauahi Bishop Museum of Polynesian Ethnology and Natural History. Vol. i. No. 2. Director's Report for 1899. Honolulu, 1900. Size 10 × 6, pp. 80. *Illustrations.*

Contains, in addition to the report on the work of the museum, papers on special subjects, including one on the mat sails of the Pacific, by J. F. G. Stokes.

Pacific Islands. **Brigham.**

An Index to the Islands of the Pacific Ocean: a Handbook to the Chart on the walls of the Bernice Pauahi Bishop Museum of Polynesian Ethnology and Natural History. By William T. Brigham. Honolulu: Bishop Museum Press, 1900. Size 12½ × 10, pp. 172. *Maps.*

This is a most useful guide to the nomenclature of the Pacific islands. In the case of non-native names, the origin of which is often difficult to arrive at, the circumstances under which the names were given are, as a rule, mentioned. The introduction gives a sketch of the history of discovery, and of the general geography and ethnology of the Pacific, while the main facts relating to the more important islands are summarized in the alphabetical index.

Queensland. **Cameron and Wilson.**
Report on Geology of the West Moreton or Ipswich Coal Field. By Walter E. Cameron. Also Queensland Coal: its Economic Value as a Steam Coal. [A Paper read before the Queensland Institute of Mechanical Engineers, December, 1892, by Robert Wilson.] Brisbane, 1899. Size 13 × 8½. *Maps and Sections.*

Queensland. *Queensland Gov. Mining J.* **1** (1900): 244–248, 288–292. **Dunstan.**
Clermont Coal Measures. Report by Mr. B. Dunstan, Assistant Government Geologist. *With Sections.*

Queensland—Almanac and Directory. **Pugh.**
Pugh's Queensland Almanac and Directory for 1901. Brisbane: Gordon & Gotch. Size 9 × 5½, pp. xxxii. and 1174. *Presented by the Publishers.*

Samoa. *Kolon. Z.* **2** (1901): 92–95. ——
Aus Samoa.

Describes the present economic position in Samoa.

Solomon Islands. **Woodford.**
British Solomon Islands. Report for 1899–1900. Colonial Reports, Annual No. 320, 1901. Size 9½ × 6, pp. 16. *Price* 1*d.*

See note in Monthly Record, *ante*, p. 94.

South Pacific Ocean. **Kettle.**
A Supplement to the Fifth Edition of Findlay's Sailing Directory for the South Pacific Ocean, including revised descriptions of the Coasts, Islands, etc. By W. R. Kettle. London: R. H. Lawrie, 1901. Size 10 × 6, pp. 386. *Price* 7*s.* 6*d.* *Presented by the Publisher.*

Tasmania. **Thureau.**
Geological Society of Australasia. Notes on the occurrence of native copper at Mount Lyell, West Coast, Tasmania, with observations upon the Genesis of the Ores. By G. Thureau. Melbourne, 1900. Size 9 × 5½, pp. 12.

Western Australia. **Vivienne.**
Travels in Western Australia, being a description of the various Cities and Towns, Goldfields, and Agricultural Districts of that State. By May Vivienne. London: W. Heinemann, 1901. Size 9 × 6, pp. xvi. and 344. *Illustrations. Price* 15*s.*

Contains useful descriptions of the industries and resources of Western Australia as to which the authoress takes a very sanguine view.

Western Australia. **Clifton.**
Western Australia. Department of Lands and Surveys Report. By the Under-Secretary for Lands for the year 1899. Perth, 1900. Size 13 × 8½, pp. 66. *Illustrations. Presented by the Victoria Public Library of Western Australia.*

Contains an account, with illustrations, of the caves near the Margaret river, said to excel in extent, picturesqueness, and variety the Jenolan caves in New South Wales. The need of their protection is emphasized.

Western Australia. *P.R.S. Queensland* **16** (1901): 9–34. **Hann.**
Exploration in Western Australia. By Frank Hann.

An account of two journeys to the north-western interior of Western Australia. Very few dates are given, but the first journey seems to have been undertaken in 1896. A map is mentioned, but does not accompany the paper.

Western Australia. ——
Western Australia. Annual Progress Report of the Geological Survey for the year 1899. Perth, 1900. Size 13½ × 8½, pp. 58. *Maps and Illustrations.*

POLAR REGIONS.

Antarctic. **Arçtowski and Renard.**
Notice Préliminaire sur les Sédiments Marins recueillis par l'Expédition de la "Belgica." Par H. Arçtowski et A. F. Renard. Bruxelles, 1901. Size 9 × 6, pp. 30. *Map.*

Antarctic. *J. Franklin I.* **151** (1901): 241, 321, 413; **152** (1901): 26. **Balch.**
Antarctica; a History of Antarctic Discovery. By Edwin Swift Balch. *With Charts.*

A valuable summary of the history of Antarctic Exploration. The writer pays special attention to the little-known work of the American whaling captains in the early part of the nineteenth century.

Antarctic—Belgian Expedition. **Arçtowski.**
Aperçu sur les Recherches Océanographiques de l'Expédition Antarctique Belge. Par M. Henryk Arçtowski. (Sonderabdruck aus den Verhandlungen des VII. Internationalen Geographen-Kongresses in Berlin, 1899.) Berlin, 1900. Size 10 × 6½, pp. 652–656. *Plate.*

Antarctic Expedition. **Markham.**
Address to the Royal Geographical Society. By Sir Clements R. Markham, K.C.B., etc. Considerations respecting Routes for an Antarctic Expedition. By Sir Clements R. Markham, K.C.B., etc. (From the *Geographical Journal* for July, 1901.) Size 10 × 6½, pp. 26.

Antarctic Expedition. **Markham.**
T. and Ninth Annual Rep. Liverpool G.S. (1900): 22–42.
The Antarctic Expedition. By Sir Clements R. Markham, K.C.B., etc.

Antarctic—German Expedition. *Verh. Ges. Erdk. Berlin* **28** (1901): 249–253. ———
Taufe des Deutschen Südpolarschiffes "Gauss."

Antarctic Manual. **Murray.**
The Antarctic Manual for the use of the Expedition of 1901. Edited by George Murray, F.R.S. With a Preface by Sir Clements R. Markham, K.C.B., F.R.S. London: Royal Geographical Society, 1901. Size 9 × 6, pp. xvi. and 586. *Maps and Illustrations.*

A summary of the contents of the Manual is given at p. 159, *ante.*

Arctic—Abruzzi Expedition. *Cosmos* **13** (1901): 30–40. **Cora.**
La Spedizione Artica di S. A. R. il Duca degli Abruzzi (1899–1900). Umberto Cagni raggiunge 86° 33′ 49″ lat. N. Cenni generali di Guido Cora.

Arctic Exploration. *M.G. Ges. Wien* **44** (1901): 53–73. **Anschütz-Kaempfe.**
Das europäische Eismeer und ein neuer Expeditionsplan nach dem Nordpole. Von Dr. Hermann Anschütz-Kaempfe.

The writer's project was described in the last volume of the *Journal* (xvii. p. 435).

Arctic Vegetation. *Sitzb. A.W. Wien* **109** (Ab. i.) (1900): 371–439. **Wiesner.**
Untersuchungen über den Lichtgenuss der Pflanzen im arktischen Gebiete. Photometrische Untersuchungen auf pflanzenphysiologischem Gebiete. (III. Abhandlung.) Von J. Wiesner.

The general results of Dr. Wiesner's researches were noticed in the *Journal* for June (vol. xvii. p. 665).

Greenland. **Dusén.**
Några viktigare vaxtfynd från nordöstra Grönland. Af P. Dusén. Size 9 × 5½, pp. [4]. [1901.]

A list of plants obtained from North-East Greenland, with statement of the localities, etc.

Greenland. **Nathorst.**
On the map of King Oscar Fjord and Kaiser Franz Josef Fjord in North-Eastern Greenland. By Dr. A. G. Nathorst. (From the *Geographical Journal* for January, 1901.) Size 10 × 6½, pp. 16. *Maps and Illustrations.*

MATHEMATICAL GEOGRAPHY.

Astronomy. **Downing.**

Taylor's General Catalogue of Stars for the Equinox 1835·0, from Observations made at the Madras Observatory during the years 1831 to 1842. Revised and Edited by A. M. W. Downing, D.SC. Edinburgh, 1901. Size 12½ × 10, pp. 10 and cclxxviii.

Astronomy. ——

Publications of the United States Naval Observatory. Second Series, vol. i. Transit Circle Observations of the Sun, Moon, Planets, and Miscellaneous Stars, 1894–1899. Washington, 1900. Size 12 × 9, pp. cviii. and 402. *Presented by the U.S. Naval Observatory.*

Nautical Almanac. ——

The American Ephemeris and Nautical Almanac for the year 1904. Washington, Bureau of Equipment, 1901. Size 10½ × 7½, pp. 592. *Diagrams.*

Surveying. **Wilson.**

Topographic Surveying. Including Geographic, Exploratory, and Military Mapping, with hints on Camping, Emergency Surgery, and Photography. By Herbert M. Wilson. New York: John Wiley & Sons; London: Chapman & Hall. 1901. Size 9½ × 6, pp. xxx. and 910. *Maps and Illustrations.*

A comprehensive guide to all classes of surveys for mapping purposes, from the most detailed topographic to the crudest exploratory surveys. It is intended both as a handy reference-book for use in the field, and as a text-book for college instruction.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Age of the Earth. **Rudzki.**

Sur l'age de la Terre. Par M. P. Rudzki. (Extrait du Bulletin de l'Académie des Sciences de Cracovie. Classe des Sciences Mathématiques et Naturelles. Février, 1901.) Cracovie, 1901. Size 10 × 6½, pp. 72–94.

Figure of the Earth. *J. Geology* 9 (1901): 244–249. **Keyes.**

Derivation of the Terrestrial Spheroid from the Rhombic Dodecahedron. By Charles R. Keyes.

On recent attempts, especially that of Richard Owen in 1888, to reduce the Earth to regular geometric form.

Geological History. **Burckhardt.**

Traces Géologiques d'un Ancien Continent Pacifique. Par Dr. Carl Burckhardt. Revista del Museo de La Plata (Du Tome x. page 177 et suivantes). La Plata, 1900. Size 11 × 7½, pp. 16. *Map and Illustration.*

Geological History. *M.G. Ges. Wien* 44 (1901): 74–103. **Lozinski.**

Die chemische Denudation—ein Chronometer der geologischen Zeitrechnung. Von Val. Ritt. v. Lozínski.

Geomorphology. *C. Rd.* 132 (1901): 1428–1430. **Lamothe.**

Sur le rôle des oscillations eustatiques du niveau de base dans la formation des systèmes de terrasses de quelques vallées. Note de M. de Lamothe.

Gravity. *Sitzb. A.W. Berlin* (1901): 328–336. **Helmert.**

Der normale Theil der Schwerkraft im Meeresniveau. Von F. R. Helmert.

Gravity. *G.Z.* 7 (1901): 305–322. **Messerschmitt.**

Die Verteilung der Schwerkraft auf der Erde. Von Dr. J. B. Messerschmitt.

Meteorology—Climates. *Abh. k.k. G. Ges. Wien* 3 (1901): pp. 52. **Coellen.**

Der Gegensatz in den aussertropischen Klimaten der continentalen West- und Ostküsten auf der Nordhemisphäre. Von Ludwig Coellen.

Meteorology—Rainfall. *Monthly Weather Rev.* **29** (1901): 6–8. **Alexander.**
The Relation of Rainfall to Mountains. By W. H. Alexander.

Meteorology—Relative Humidity. **Mazelle.**
Sitzb. k. A.W. Wien **108** (Ab. II. *a.*) (1899): 281–322.
Zur täglichen Periode und Veränderlichkeit der relativen Feuchtigkeit. Von Eduard Mazelle.

Oceanography. *Verh. Ges. Erdk. Berlin* **28** (1901): 226–232. **Schott.**
Die Wärmeverteilung in der Tiefsee, mit besonderer Berücksichtigung des "Valdivia"-Materials. Von Dr. G. Schott.

Oceanography. **Nansen.**
Some Oceanographical Results of the Expedition with the "Michael Sars" headed by Dr. J. Hjort in the summer of 1900. Preliminary Report by Fridtjof Nansen. Christiania: Printed by A. W. Brøgger, 1901. Size 9½ × 6, pp. 129–161. *Diagrams. Presented by the Author.*

Oceanography—Methods. **Ekman.**
On a new Current-Meter invented by Prof. Fridtjof Nansen. By V. Walfrid Ekman. (Separataftryk af *Nyt Magazin f. Naturvidenskab*, B. 39, H. 2. Kristiania, 1901.) Size 9½ × 6, pp. 163–187. *Plates.*

Pampas. **Nordenskjöld.**
Om Pampasformationen. Af Otto Nordenskjöld. (Meddelanden från Upsala Universitets Mineralogisk-Geologiska Institution, 25.) Stockholm, 1900. Size 8½ × 5½, pp. 191–206. *Map.*

Physiography. **Herbertson.**
Outlines of Physiography. An Introduction to the Study of the Earth. By A. J. Herbertson, PH.D. London: Edward Arnold, 1901. Size 7½ × 5, pp. viii. and 312. *Illustrations. Price 4s. 6d. Presented by the Publisher.*

This text-book is intended for more elementary students than those to whom such works as Dr. Mill's 'Realm of Nature' are appropriate. It gives a clear insight into the first principles which govern the operations of nature, and should prove a valuable help, from an educational point of view, as an introduction to the study of geography.

Phyto-Geography. *Ann. G.* **10** (1901): 260–265. **Flahault.**
La Nomenclature de la Géographie botanique. Par M. Ch. Flahault.

Phyto-Geography. *Naturw. Wochenschrift* **16** (1901): 201–209. **Höck.**
Getränke-liefernde Pflanzen, ihre einstige und heutige Verbreitung und die ihrer Erzeugnisse. Von Dr. F. Höck.

Phyto-Geography. *Abh. A. W. Berlin* (1899–1900) (ii): 1–114. **Schumann.**
Die Verbreitung der *Cactaceæ* im Verhältniss zu ihrer systematischen Geilderung. Von Prof. Dr. K. Schumann. *With Maps.*

River Deltas. *Science* **13** (1901): 952–954. **Daly.**
Marine Currents and River Deflection. By Dr. R. A. Daly. *With Diagrams.*

A note on this paper appeared in the August number (p. 219).

Sea-level. *Geolog. Mag.* **8** (1901): 167–174, 223–231, 253–265. **Pearson.**
Oscillations in the Sea-level. By H. W. Pearson. *With Diagram.*

A summary of historical indications of fluctuations of sea-level.

Seismology. ——
Publications of the Earthquake Investigation Committee in Foreign Languages. No. 5 (pp. iv. and 82), No. 6. Tokyo, 1901. Size 10 × 7, pp. viii. and 182. *Charts and Plates. Presented by the President of the Imperial Earthquake Investigation Committee.*

Solar Radiation. *Meteorolog. Z.* **18** (1901): 174–176. **Angström.**
Intensität der Sonnenstrahlung in verschiedenen Höhen, nach Untersuchungen auf Teneriffa, 1895 und 1896. Von Knut Angström.

Surface Soil. *P.R.S.* **68** (1901): 253–261. **Darwin.**

On the Small Vertical Movements of a Stone laid on the Surface of the Ground. By Horace Darwin. *With Illustrations.*

On experiments to measure the downward movement of a stone due to the action of earthworms. The movements (upward and downward) due to varying moisture and to frost were found to be greater than was expected.

Waves. *P.I. Civil Engineers* **143** (1901): 210–212. **Shield.**

Notes on the Height of Waves at Peterhead, N.B. By W. Shield.

Zoogeography. **Harvie-Brown.**

On a Correct Colour Code or Sortation Code in Colours. By J. A. Harvie-Brown. (Reprinted from the 'Transactions of the Edinburgh Field Naturalists' and Microscopical Society,' Sess. 1898–99.) Edinburgh: W. Blackwood & Sons, 1899. *Again* reprinted, 1900. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 41–54. *Map.*

The author suggests a colour-code for adoption for the mapping of Zoogeographical realms, etc.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropology. **Sergi.**

The Mediterranean Race: a Study of the Origin of European Peoples. By G. Sergi. London: W. Scott, 1901. Size $7\frac{1}{2} \times 5$, pp. xii. and 320. *Illustrations. Price* 6*s.*

Prof. Sergi's theories as to the affinities of the races of Europe and North Africa, though viewed with some suspicion at first, have now met with acceptance in many quarters, and their exposition in a convenient form in the present volume is to be welcomed.

Commercial Geography. **Foucart and others.**

Ministère du commerce, dé l'Industrie, des Postes et des Télégraphes. Exposition Universelle Internationale de 1900. Direction Générale de l'exploitation. Congrès International de Géographie Économique et Commerciale tenu à Paris du 27 au 31 Août 1900. Procés-Verbaux Sommaires. Par M. Georges Foucart, et MM. L. Marin, Colas des Francs, H. Froidevaux, G. Bourgoin, Paris, 1901. Size $10\frac{1}{2} \times 7$, pp. 68.

Commercial Geography—Iron and Coal. **Atkinson.**

The Dominion of Iron and Coal. What it stands for. By Edward Atkinson. Baltimore: Manufacturers' Record, 1900. Size $8\frac{1}{2} \times 6$, pp. 14. *Presented by the Author.*

The author estimates that the world's consumption of iron and steel will have risen by 1910 to at least 55,000,000 tons a year, and that 50 per cent. of this will be supplied by the United States.

Commercial Geography—Rubber. *Globus* **79** (1901): 205–206. **Neger.**

Der Stand der Kautschukgewinnung, vorzugsweise im tropischen Afrika, und die Frage der Kautschukpflanzenkultur. Von Dr. F. W. Neger.

Ethnology—Canoes. *Rep. Smithsonian I.* (1899), *U.S. National Museum.* **Mason.**

Pointed Bark Canoes of the Kutenai and Amur. By Otis T. Mason. *With Illustrations.*

A description of two forms of canoe, which, though found in different continents, are "like to each other and unlike to any other craft in either hemisphere."

Historical—Civilization. **Bense.**

The Civilising Race. By E. M. Bense. London: Simpkin & Co., 1901. Size 8×5, pp. viii. and 260. *Price* 12*s. Presented by the Publishers.*

Consists largely of wild speculations on the origin and early history of civilization. Historical evidence is generally either disregarded or twisted to suit the arbitrary hypotheses of the writer, who possibly does not intend the book to be taken seriously.

Historical—Cook's Voyages. **Cash.**

The Life and Voyages of Captain James Cook. Selections, with Introductions and Notes. By C. G. Cash. London: Blackie & Son, [1901]. Size $7\frac{1}{2} \times 5$, pp. 192. *Price* 1*s. Presented by the Publishers.*

This is the latest issue of Blackie's "School and home library." It consists of judiciously chosen extracts from the official account of Cook's voyages.

Historical—D'Albaigne. **Hamy.**

Nouveaux Documents sur les Frères D'Albaigne et sur le projet de voyage de découvertes présenté en 1566 à la cour de France. Par M. E.-T. Hamy. (Extrait du *Bulletin de géographie historique et descriptive*, No. 1, 1899.) Paris: 1900. Size 9½ × 6½, pp. 12.

BIOGRAPHY.

Chalmers. *Miss. Record United Free Church Scotland* (1901): 253–256. **Robson.**

James Chalmers of New Guinea. By the Rev. George Robson, D.D. *With Portraits and Illustrations.*

Chalmers and Tomkins. *Chron. London Miss. S.* **65** (1901): 126–129. ———

James Chalmers and Oliver Tomkins of New Guinea. *With Portraits.*

Drygalski. *Deutsche Rundschau G.* **23** (1901): 374–376. ———

Erich Dagobert v. Drygalski. *With Portrait.*

Fiorini. *Riv. G. Italiana* **8** (1901): 245–260. **Bertacchi.**

Il Prof. Matteo Fiorini e la Geografia Matematica. Nota del Prof. Cosimo Bertacchi.

Prof. Fiorini, well known for his writings on cartography and allied subjects, was born in 1827 and died in January last.

Haughton. **Yate.**

Lieut.-Colonel John Haughton, Commandant of the 36th Sikhs. A Hero of Tirah. A Memoir. By Major A. C. Yate. London: John Murray, 1900. Size 9 × 6, pp. xvi. and 238. *Portrait, Maps, and Illustrations.* 12*s. net. Presented by the Author.*

This memoir presents to the British army the example of one who "personified a very high ideal of coolness, capacity for command, courage, and devotion," but whose heroic death at Shinkamar during the Tirah campaign is, the author thinks, in danger of being forgotten by the general public.

Parkes. **Lane-Poole.**

Sir Harry Parkes in China. By Stanley Lane-Poole. London: Methuen & Co., 1901. Size 8 × 5, pp. xxvi. and 386. *Portrait and Maps. Price* 6*s. Presented by the Publishers.*

This work gives, in a more concise form than the two-volume biography written by the same author in 1894, an account of the life of one of the most important actors in the history of British relations with China. As is remarked in the preface, there is very little in that history which is not illustrated by the life-work, either of Sir Rutherford Alcock (lately dealt with by Mr. Michie) or of Sir Harry Parkes, and the volume is therefore of much interest at the present time.

Ruge. *Geogr. Anzeiger, Pet. Mitt.* **2** (1901): 33–35. **Partsch.**

Sophus Ruge, von Prof. Dr. Partsch.

GENERAL.

British Colonies. ———

Combined Circulars on Canada, the Australasian and South African Colonies. Issued by the Emigrants' Information Office. January, 1901. Size 8½ × 5½, pp. 18, 46, 16. *Sketch-maps.*

British Colonies—Coal. *Rev. Française* **26** (1901): 281–288. **Barré.**

La Houille dans les Colonies Anglaises. Par Paul Barré.

British Empire. **Lee.**

Britain over the Sea. A Reader for Schools. Compiled and Edited by Elizabeth Lee. London: John Murray, 1901. Size 8 × 5½, pp. xlvi. and 238. *Maps. Price* 2*s.* 6*d. Presented by the Publisher.*

The compiler has carried out the excellent idea of bringing together for educational purposes a selection of extracts from standard writers, all bearing on the principles and history of British Colonial expansion. The authors put under contribution range from Bacon to Lord Beaconsfield, while a limited number of extracts from the writings of Mungo Park, Livingstone, etc., give an insight into the conditions under which the work of extending British influence has been performed. This side of the question might perhaps with advantage have been more comprehensively dealt with, but taken as a whole the selection has been made with much judgment.

Congress. ——

Verhandlungen des Siebenten Internationalen Geographen-Kongresses, Berlin, 1899. 2 vols. Berlin: W. H. Kühl, 1901. Size 10 × 6½, pp. (vol. i.) xiv. and 465; (vol. ii.) xvi. and 982. *Maps and Diagrams. Presented by the Congress.*

The report of the Berlin meeting of the International Geographical Congress is presented in two handsome volumes, of which the first is devoted to the proceedings at the meetings of the Congress, the second gives the text of the papers read, one hundred and twenty-four in all, illustrated by a considerable number of maps and diagrams.

Geography. **Claparède.**

Coup d'œil sur la Géographie et ses divisions en général et sur la Géographie Economique et Sociale en particulier. Par Arthur de Claparède. Genève, 1901. Size 7½ × 5, pp. 30.

The writer adopts, as the best yet supplied, the definition of geography given by Dr. Mill in the 'International Geography.'

Geography. *T. and Ninth Annual Rep. Liverpool G.S.* (1900): 42–52. **Wilkinson.**

On the Means of Popularising Geography as a Study. By F. J. Wilkinson.

Geography and History. **George.**

The Relations of Geography and History. By the Rev. H. B. George, M.A. Oxford: the Clarendon Press, 1901. Size 8 × 5½, pp. viii. and 296. *Maps. Price* 4*s.* 6*d. Presented by the Clarendon Press.*

This will be specially noticed.

Lisbon Geographical Society. ——

Boletim da Sociedade de Geographia de Lisboa. Numero commemorativo do 25° anniversario da Sociedade. Abril de 1901. Lisboa, 1901. Size 10 × 6½, pp. 84. *Illustrations.*

Malarial Fever. **Stephens, Christophers, and Daniels.**

Reports to the Malaria Committee of the Royal Society. Fifth Series. London: Harrison & Sons, 1901. Size 8½ × 5½, pp. 78. *Diagrams. Presented by the Royal Society.*

This series includes reports on the proposed site for European residents in the Freetown Hills, which, it is hoped, on account of its dryness, and by the exclusion of native dwellings, will prove free from malaria; on the distribution and breeding-grounds of *Anopheles* in British Central Africa; and on blackwater fever both in East and West Africa.

Metric System. ——

Commercial. No. 1 (1901). Reports from Her Majesty's Representatives Abroad on the Metric System. Part ii. London: Eyre & Spottiswoode, 1901. Size 10 × 6, pp. 34. *Price* 2½*d.*

Gives information as to the adoption and working of the metric system in various foreign countries.

Mountain Sickness. *Alpine J.* **20** (1901): 368–393. **Hepburn.**

The influence of High Altitudes in Mountaineering. By Malcolm L. Hepburn, M.D.

An attempt to put together for the use of mountaineers the experience so far acquired by climbers and others on the subject of so-called mountain-sickness. The writer urges the need of caution in ascribing *all* the symptoms experienced to the effect of altitude only.

Population of the Earth. **Supan.**

Die Bevölkerung der Erde . . . Herausgegeben von Alexander Supan. XI. Asien und Australien samt den Südsee-Inseln. (Dr. A. Petermanns Mitteilungen.

Ergänzungsheft No. 135.) Gotha: Justus Perthes, 1901. Size 11 × 7½, pp. 108. *Map. Price* 6 *m.* 40 *pf.*

A new issue of this indispensable publication will be welcomed by statisticians.

Portuguese Colonies. *Questions Dipl. et Colon.* 11 (1901): 531–536. **Hauser.**

Études sur les colonies portugaises.—V. L'empire portugais: conclusion. Par M. le Prof. H. Hauser.

Portuguese Colonies—Railways. ——

Album de Estatistica Graphica dos Caminhos de Ferro Portuguezes das Provincias Ultramarinas, 1898. Lisboa: Companhia Nacional Editora. Size 15 × 10½, pp. xii. *Diagrams and Map.*

The statistics of the Portuguese Colonial Railways are illustrated by a variety of graphic methods, maps of the railways being also given.

Rumanian Geographical Society. *B.S.G. Romînă* 21 (1900): 1–34. ——

Serbarea Jubileuluĭ 6/19 si 7/20 Decemvrie 1900. 1875—Junie 15—1900. *With Plate.*

On the proceedings in celebration of the twenty-fifth anniversary of the founding of the Rumanian Geographical Society.

Telephotography. *Alpine J.* **20** (1901): 393-403. **Shea.**

Telephotography. By Charles E. Shea. *With Illustrations.*

The writer considers that the telephotographic lens has placed in the hands of the photographer a power the complete extent of which is not fully realized.

Travel. **White.**

Pacific Tours and Around the World. By Trumbull White. Chicago, 1900. Size 8 × 6, pp. 206. *Maps and Illustrations. Presented by the American and Australian Line.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

England. **Bartholomew.**

Bartholomew's Cyclists' Road Map of the Manchester and Liverpool Districts. Scale 1 : 126,720 or 2 stat. miles to an inch. Reduced from the new revised Ordnance Survey. J. Bartholomew & Co., Edinburgh. *Price* 1*s.* 6*d.* mounted on cloth. *Presented by the Publishers.*

The area included in this map is approximately from Leeds on the north to Wrexham on the south, and from Flint on the west to Sheffield on the east. All important roads are coloured brown, and in addition to contour lines, heights are given in figures. Generally speaking, this map is similar in style to the other sheets of Bartholomew's Reduced Ordnance Survey series, except that no orographical colouring is given, which is certainly to be regretted. However, it is doubtless in great measure owing to this fact that it has been possible to publish it for such a small sum.

England and Wales. **Ordnance Survey.**

Ordnance Survey of England and Wales:—Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from July 1 to 31, 1901.

1-inch:—

With hills in brown or black, 139, 157, 180, 210, 230 (engraved), 1*s. each;* printed in colours, 212, 1*s.*; 230 and 247 (combined), 1*s.* 6*d.*

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Borough of Birkenhead in one sheet. 2*s.*

25-inch—County Maps:—

Bedfordshire, I. 10, 11, 12, 14, 15, 16; II. 13; III. 7, 11, 12, 15, 16; IV. 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 16; V. 1, 5, 6, 7, 9, 10, 11, 13, 14; VI. 3, 4, 7, 8, 10, 11, 12, 14, 15, 16; VII. 1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 15; VIII. 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 13, 14, 16; IX. 1, 9, 10, 13; XI. 12, 15, 16; XVI. 3, 4; XVIII. 1, 10. **Cardiganshire,** I. 4, 15, 16; II. 1. **Derbyshire,** LVII. 2, 5, 6, 13, 14; LVIIA. 4. **Huntingdonshire,** (VIII. 12 and IX. 9); VIII. 16; (IX. 9 and VIII. 12); IX. 13; XII. 4, 11, 13, 15, 16; XIII. 2, 5, 6, 13 (XVI. 1 and XVIA. 4); XVI. 2, 4; (XVI. 5 and XVIA. 8); XVI. 6, 7, 8, 9, 10, 11, 12, 13, 15; (XVIA. 4 and XVI. 1); (XVIA. 8 and XVI. 5). **Merionethshire,** XV. 8; XXI. 16; XXXVI. 6; XXXVIII. 8; XXXIX. 1; XLI. 16; XLII. 15; XLIII. 3, 5, 6; XLVI. 16; XLVII. 3, 6, 7, 9, 10, 11, 13, 14; XLVIII. 4; XLIX. 1. **Monmouthshire,** V. 5, 10, 13, 14; VI. 14; VIII. 1, (2 and 3), 5, 6, 7; (VIII. 8 and IX. 5); VIII. 9, 11, 12; (IX. 5 and VIII. 8); XI. 6, 7, 13, 14, 15; XII. 9, 13; XIII. 12, 16; XVII. 3; XVIII. 6, 12, 14, 15; XIX. 2, 7, 9, 11, 16; XXII. 3, 4, 7; XXIII. 2, 4, 5, 6, 10, 14; XXIV. 3, 5, 12, 13, 15, 16; XXVII. 3; XXVIII. 1, 2, 6, 7; XXIX. 1, 2, 3, 4, 6, 11. **Montgomeryshire,** IV. 4, 12, 13, 15, 16; V. 1, 2, 6, 7, 9, 10, 11, 13, 14, 15, 16; VI. 14; VII. 4; VIII. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; IX. 1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 13, 14, 15, 16; X. 1, 2, 5, 7; XII. 4, 12; XIII. 4, 5, 6, 11; XIV. 1, 2, 3, 6; XIX. 3, 5, 6, 7; XXI. 11; XXV. 7, 11, 13, 14; XXXII. 1. **Shropshire,** III. 11, 12, 15; V. 4, 7, 13, 15; VA. 16; VII. 4, 7; VIII. 10, 12; IX. 2, 3, 5, 6, 9; XI. 4, 7, 8, 11, 12, (15 and 16); XII. 9; XVIII. 3, 4; XIX. 1, 5. **Staffordshire,** XXIX. 3, 9, 10, 13, 14, 15, 16; XXX. 1, 8, 12, 16; XXXI. 6, 10; XXXII. 1; XXXVII. 2, 3, 4, 12, 13; XXXVIII. 2, 3, 4, 5, 6, 7, 8, 11, 12, 15, 16; XXXIX. 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; XL. 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13, 14, 15; XLI. 5, 13, 14. **Wiltshire,** LVI. 4, 8, 11, 15, 16; LVII. 9, 13; LVIII. 13; LXII. 3, 4; LXIII. 1, 2, 3, 4, 6, 7, 8, 11; LXIV. 1; LXVI. 7, 9, 10, 14; LXVII. 13, 14; LXIX. 5, 9, 14; LXXI. 2, 3, 4, 12, 16; LXXII. 2, 3, 5, 6, 7, 9, 13; LXXIV. 3, 7; LXXVI. 1, 4, 8. 3*s. each.*

4 miles to 1 inch:—

14 (engraved). 1*s.* 6*d.*
County maps with roads printed in colour:—(Anglesey, Carnarvonshire, Denbighshire, Flintshire, and Merionethshire); (Cardiganshire, Carmarthenshire and Pembrokeshire); Carnarvonshire, see Anglesey; Cornwall; (Cumberland and Westmorland); Devonshire; Dorset, see Somerset; Denbighshire, see Anglesey; Flintshire, see Anglesey; (Glamorganshire and Monmouthshire); Merionethshire, see Anglesey; (Norfolk and Suffolk); Monmouthshire, see Glamorgan; Pembrokeshire, see Cardiganshire; (Somerset and Dorset); Suffolk, see Norfolk; Westmorland, see Cumberland; Yorkshire (western half), Yorkshire (eastern half). 9*d. each.*
(*E. Stanford, London Agent.*)

Iceland. **Thoroddsen.**

Uppdrattur Islands. Scale 1 : 600,000 or 9·5 stat. miles to an inch. Th. Thoroddsen, 1900. Axel E. Aamodt, Copenhagen.

Dr. Thoroddsen has spent a considerable portion of his time since 1881 in Iceland, where he has travelled extensively and performed most useful topographical and

geological survey work, in recognition of which he was, in 1897, awarded the Cuthbert Peek grant of this Society. Several maps and papers, giving the results of Dr. Thoroddsen's surveys, have appeared from time to time in *Petermanns Geographische Mitteilungen*, and a map of the whole island by him, with a paper, appeared in the *Geographical Journal* for May, 1899; but that now published is on a much larger scale, and in certain parts gives more details than the one prepared by this Society. In some respects it is, however, not so complete, and there are districts where names of streams and other details are given on the former, but which do not appear on the present map. Then, again, there are no altitudes given on this map, which surely is an oversight, as they would have added considerably to its value.

In addition to the surveys of Dr. Thoroddsen, the well-known map of Gunnlaugson, of the early part of the last century, and the Admiralty charts, have been utilized in the compilation.

London. **Philip.**

Philip's Handy Volume Atlas of London. A séries of 55 sectional maps (on a scale of 3 inches to the mile) of the County of London, with 12 special maps and plans, a directory of public buildings, &c., and a complete index. 3rd edition. London: George Philip & Son, 1901. *Price 5s.*

This is the third edition of a very portable plan of London, in atlas form, the first edition of which appeared in 1891. Although the date of publication of this edition is given as 1901, this is somewhat misleading, as in several districts it is behind the time, and it is to be regretted that more care has not been taken with the revision.

Russian Empire. **Petermanns Geographische Mitteilungen.**

Neue Klimakarten des Russischen Reiches, nach dem *Atlas climatologique de l'Empire de Russie*, 1900. 1. Luftdruck im Jahresmittel, im Januar, im April, im Juli, im Oktober.—Temperatur im Jahresmittel, im Januar, im April, im Juli, im Oktober.—2. Absolute Temperatur-Maxima, Gefrierdauer des Gewässer, jährlicher Niederschlag, Niederschlag im Winter, im Früling, im Sommer, im Herbst. *Petermanns Geographische Mitteilungen*, Jahrang 1901, Tafels 11 und 12. Gotha: Justus Perthes. *Presented by the Publisher.*

Eighteen maps, on two sheets, illustrating the meteorological phenomena of the Russian Empire, according to the new Climatological Atlas of the Nicolas Central Physical Observatory, St. Petersburg, which was noticed in the June number of the *Geographical Journal* for this year.

ASIA.

Palestine. **Smith and Bartholomew.**

Topographical and Physical Map of Palestine, by J. G. Bartholomew, F.R.S.E. Edited by G. A. Smith, D.D., LL.D. Scale 1 : 253,440 or 4 stat. miles to an inch. Edinburgh: T. & T. Clark, 1901. With an index. *Presented by the Publishers.*

This is the map which was noticed in the July number of this journal for this year, with the addition of a very useful index to place-names. It is now published by Messrs. T. & T. Clark, of Edinburgh.

AFRICA.

West Africa. **Philip.**

Philip's Gold-field Map of West Africa. Scale 1 : 126,720 or 2 stat. miles to an inch. Tarkwa sheet. London: George Philip & Son, 1901. *Price 10s. a sheet.*

This is the first sheet that has been issued of Philip's gold-field map of West Africa, and includes the region between the coast and 5° 50′ N. lat., and 1° 30′ and 2° 19′ W. long. A list of the principal authorities upon which the map is based is given, and as a general map it will be useful for reference, although in parts it may not be very reliable on account of the scanty information obtainable. It is to those who are interested in gold-mining in the district that it will principally appeal, for all concessions and claims are clearly laid down and distinguished by different colours, and much other information given that will be of special importance to those who are concerned in the development of the gold-mines. The new railway from Sekondi to Tarkwa, as laid

Engraved or photozincographed (where not published in quarter sheets). Size 36 × 24 inches . . . .

14. Ireland, engraved or heliozincographed, contours in black, latitude and longitude not marked. Size 36 × 24 inches . . . .

$\frac{1}{2500}$ Scale.

15. Houses ruled in black, water blue or black lined, latitude and longitude not marked. Size 38 × 25½ inches . . . .

16. Houses red, water blue, roads brown, latitude and longitude not marked. Unrevised editions only coloured in this form. Size 38 × 25½ inches. From 2*s*. 6*d*. to 23*s*., according to the amount of colouring. This form is gradually being superseded by 15.

Town Scales.

17. $\frac{1}{500}$ scale, houses stippled. Size 38 × 25½ 2

18. Ditto, houses ruled. Size 38 × 25½ 2

19. Ditto, houses red, water blue, roads brown. Size 38 × 25½ inches. From 2*s*. 6*d*. to 15*s*., according to the amount of colouring. Applies to unrevised only.

20. 5-feet scale, houses stippled. Revised. Size 36 × 24 inches 2

Index Maps.

21. Indexes to the sheets of the 1-inch scale maps of England and Wales, Scotland, and Ireland, scale 30 miles to an inch. Sizes about 18 × 13 inches 0

22.*Index to the sheets of the 6-inch scale map, parishes coloured.
England and Wales. Size 18 × 12 inches 1
Scotland. Size 24 × 18 inches 1

23.*Index to the sheets of the 1 : 2500 scale map, parishes coloured.
England and Wales. Size 18 × 12 inches 1
Scotland. Size 24 × 18 inches 1

Nos. 22 and 23 are identical with Nos. 2 and 6, but with sheet lines added, printed on thin paper, and coloured to show civil parishes.

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* Publication in progress.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, May and June, 1901. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
2401	m = 2·75	Sea of Marmara:—Buyuk Chekmejeh bay. 1*s.* 6*d.*
3206	d = 1·6	Antarctic ocean, Sheet VIII. 2*s.* 6*d.*
3177	d = 1·1	South polar chart. 2*s.* 6*d.*
3205	m = 0·1	South Shetlands and adjoining islands and lands. 2*s.* 6*d.*
3202	m = 2·0	Plans of anchorages on the west coast of Newfoundland:—Bear cove. Red island road. Ship cove. 1*s.* 6*d.*
635	m = 3·5	Cuba:—Port Banes. 1*s.* 6*d.*
2820	m = 2·4	United States, south coast:—Entrance to Pensacola bay. 2*s.* 6*d.*
3161	m = 3·0	Africa, west coast:—River Congo, Camoens point to Princes island. 2*s.* 6*d.*
1845	m = 1·2	Bay of Bengal:—Moulmein river and approaches. 2*s.* 6*d.*
3190	m = 3·0	Andaman islands:—Temple sound. 1*s.* 6*d.*
3193	m = $\begin{cases}3\cdot0\\2\cdot1\end{cases}$	Philippine islands:—Port Sebú. Tinaan anchorage. 2*s.*
3153	m = 1·4	Japan, Inland sea:—Manuyama zaki to Ominase. 2*s.* 6*d.*
3199	m = var.	Anchorages in the Solomon islands:—Islands in Manning strait. Allardyce harbour. Ko rig ko lai bay. Southern portion of the Lord Howe islands. 1*s.* 6*d.*
467		Plans on the coast of Chile, plan added:—Caleta Junin.
2889		Plans on the coast of Peru, plan added:—Salaverry road.
1294		Plans on the coast of Peru, plan added:—Huanchaco road.
1141		Islands in the North Pacific, plan added:—Lisiansky island.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.	Cancelled by	No.
2401 Buyuk Chekmejeh bay.	New plan. Buyuk Chekmejeh bay	2401
423 Plan of Port Banes on this sheet.	New plan. Port Banes	635
1285 Plan of Salaverry road on this chart.	New plans. Salaverry road on this chart	2889
2820 Entrance to Pensacola bay.	New plan. Entrance to Pensacola bay	2820
1845 Moulmein river.	New chart. Moulmein river and approaches	1845
2391 Plan of Port Sebú on this sheet.	New plan. Port Sebú on this sheet	3193

Charts that have received Important Corrections.

No. 2474, Hebrides:—Barra head to Scarpa island. 1471, Ireland, east coast:—Kingston harbour. 125, Belgium:—Ostend roads. 2310, Norway, west coast:—Donnœsö to Fleina. 367, France, south coast:—Port of Cette. 1093, Italy, west coast:—Civita Vecchia. 1402, Italy, west coast:—Ports Maurizio and Oneglia. 2711, Adriatic:—Gulf of Quarnero. 2282, Arctic ocean and Greenland sea. 235, America, north coast:—Davis strait and Baffin bay. 3091, Newfoundland:—Little bay island to League rocks. 2042, Cape Breton island:—Sydney harbour. 192, United States, south coast:—Galveston entrance. 2067, British Columbia:—Harbours in Discovery passage, etc. 744, India, west coast:—Cape Ramas to Alvagudda. 754, Bay of Bengal:—Dhamra river. 2757, China sea:—Banka strait to Singapore. 2637, Celebes:—Strait of Makassar, south part. 2636, Celebes:—Strait of Makassar, north part. 951, Japan:—Kii channel to Owasi bay. 357, Japan:—Harbours in the Kii channel. 1069, Australia:—Port Jackson. 2540, New Zealand:—Arvarua or Bluff harbour.

(*J. D. Potter, Agent.*)

North Atlantic Ocean and Mediterranean Sea. **Meteorological Office, London.**
Monthly Pilot Chart of the North Atlantic Ocean and Mediterranean Sea for August, 1901. Meteorological Office, London. *Price* 6*d*. *Presented by the Meteorological Office.*

U.S. Charts. **U.S. Hydrographic Office.**
Pilot Charts of the North Atlantic Ocean for July and August, and North Pacific Ocean for August, 1901. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Asia Minor. **Mardon.**
Fifty Photographs of North-West Asia Minor, by E. J. Mardon, Esq., 1901. *Presented by E. J. Mardon, Esq.*

Though small in size, these are remarkably clear photographs of North-West Asia Minor. Mr. E. J. Mardon has previously presented photographs to the Society, which have been noticed in this *Journal*, and those mentioned in this list were taken by him during his most recent travels.

(1) Ismid from the railway; (2) Biledjik; (3) Typical costumes at a railway station; (4) Karahissar, with native cart in foreground; (5) Cemetery, town, and hill, with castle at Afiun Karahissar; (6) Terminus of Smyrna line at Karahissar; (7) Inn at Ushák; (8) Bridge near Ushák; (9) Hammam river, where Nshak Chivril road crosses it; (10) Houses and well, Svasli; (11) Graveyard and mosque, Svasli; (12) "Khan," or inn, at Chivril; (13) Principal street in Chivril; (14) On the march—donkey transport; (15) Euchakwa, with Ak Dagh beyond; (16) Turkoman and Turkish women; (17) Bazaar, well, and mosque, Euchakwa; (18) Water-mills and dams on outskirts of Euchakwa; (19) Turkish sportsmen; (20) Loading up donkeys; (21) Houses on hillside, Homa; (22) Western slopes of Ak Dagh; (23) Yurik tents; (24) Yurik houses and tent; (25) Yurik man and women; (26) Yurik women at a fountain; (27) Camp at Duzbel Chasma, 3770 feet; (28) Camp kitchen; (29) Top of Ak Dagh; (30) Eastern slopes of Ak Dagh; (31) Camp on east side of Ak Dagh at 4270 feet; (32) Crossing pass over the Dagh with camel transport; (33) Fort of the Maimun Dagh; (34) Unloading native cart; (35) Slopes of Maimun Dagh looking south; (36–39) Views of rocky hillside in Maimun Dagh where ibex are found; (40) Ibex and mullah; (41) Yurik cowboys; (42) Villager out ibex-shooting; (43) Tahsildar or revenue collector; (44) Sutledge village; (45) Sutledge railway station; (46) Aqueduct near Smyrna; (47) Citadella at Smyrna; (48) Smyrna from citadella; (49) View down gulf of Smyrna; (50) No title.

Egypt. **Lloyd.**
Twenty-eight Photographs taken in the neighbourhood of El Obeid, by Captain H. D. W. Lloyd. *Presented by H. D. W. Lloyd.*

Owing to the fact that this region has been for so long closed to Europeans, these photographs are of more than ordinary interest. They are small, but most of them are fairly good; and, what is very important, Captain Lloyd has taken pains to write a clear and full description of each of them.

(1, 2) Women drawing water from a tebeldi tree near Nahut; (3) Baobab tree; (4) Old Bashi Bazuk, now the salesman, Nahut; (5) Tebeldi tree at Nahut; (6) Suk (market) at Nahut; (7) Suk en Nahut; (8) Ostrich in zereiba at H. Ibrai Prim, near Foga; (9) Kitchen on the march, Bur Islam; (10, 11) Horsemen, El Obeid; (12) Messeria horsemen, El Obeid; (13) Said el Make's people, El Obeid; (14) Head sheikh of the Messeria; (15) El Obeid; (16) Wanotir, Maalia tribe; (17) S. Yasin Yusif, head sheikh, Gowama; (18) S. Nur Hussein, head sheikh of the Gimmas; (19) Women, Taiara; (20–22) Cattle at El Birka; (23–25); Shenabla women at Zereiga wells; (26) Zereiga wells; (27) Zeid cutting up water-melons for camel on the way to Foga; (28) A sheikh.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

ORDNANCE SURVEY MAPS.

following is a list of the various Ordnance Survey Maps of the British Isles on to the public, together with the prices. E. Stanford, 12, 13 and 14, Long Acre, C., is the London agent; there are also provincial agents in most of the important ns of England, Scotland, and Ireland. In places where no agent exists, the maps be obtained through the principal local post offices.

1-inch Scale.

	Price per sheet. s.	d.
1. England and Wales, old series, in black, with outline and hill hachures.		
Size 36 × 24	2	6
Size 18 × 12	1	0
2. Ditto, outline, contours in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
3.*Ditto, hills hachured in brown, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
4.*Ditto, hills hachured in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
5.*Ditto, hills hachured in brown, contours red, roads brown, water blue, magnetic variation shown, latitude and longitude not marked. Size 18 × 12 inches. On linen-backed paper, either flat (with a few exceptions) or folded in covers. Single sheets	1	0
Combined sheets	1	6
6. Scotland, outline and contours in black, latitude and longitude marked. Size 24 × 18 inches. On paper	1	9
7.*Ditto, hills hachured in brown, and black contours, latitude and longitude marked. Size 24 × 18 inches. On paper	1	6
8. Ireland, outline, not contoured, in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
9. Ditto, hills hachured in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
10.*Combined maps of areas round certain large towns, or other areas, such as the New Forest and Lake District, and published in various forms and sizes. These maps usually show outline and contour in black and roads in brown. In sheets, unmounted . . . 9*d.* to	1	0
Folded in cover . . . 1*s.* to	1	6

4 Miles to an Inch.

	s.	d.
11.*England and Wales, engraved in black, latitude and longitude marked, no hill shading or contours. Size 22½ × 15 inches. On paper	1	6
12.*County maps, cheap edition, roads in brown, latitude and longitude marked, on thin paper or folded in covers. Kent, size 22½ × 17 inches. Northumberland and Durham (combined), size 17¾ × 23¾ inches. In sheets, unmounted	0	6
Folded in covers	0	9

6-Inch Scale.

	s.	d.
13. Great Britain, water coloured blue or black lined, contours in black, latitude and longitude marked.		
Heliozincographed and photozincographed. Size 18 × 12 inches	1	0

* Publication in progress.

	Price per sheet.
	s. *d.*
Engraved or photozincographed (where not published in quarter sheets). Size 36 × 24 inches	2 6
14. Ireland, engraved or heliozincographed, contours in black, latitude and longitude not marked. Size 36 × 24 inches	2 6

$\frac{1}{2500}$ Scale.

15. Houses ruled in black, water blue or black lined, latitude and longitude not marked. Size 38 × 25½ inches	3 0
16. Houses red, water blue, roads brown, latitude and longitude not marked. Unrevised editions only coloured in this form. Size 38 × 25½ inches. From 2*s*. 6*d*. to 23*s*., according to the amount of colouring. This form is gradually being superseded by 15.	

Town Scales.

17. $\frac{1}{500}$ scale, houses stippled. Size 38 × 25½	2 6
18. Ditto, houses ruled. Size 38 × 25½	2 6
19. Ditto, houses red, water blue, roads brown. Size 38 × 25½ inches. From 2*s*. 6*d*. to 15*s*., according to the amount of colouring. Applies to unrevised only.	
20. 5-feet scale, houses stippled. Revised. Size 36 × 24 inches	2 6

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England and Wales. Size 18 × 12 inches	1 0
Scotland. Size 24 × 18 inches	1 9

Nos. 22 and 23 are identical with Nos. 2 and 6, but with sheet lines added, printed on thin paper, and coloured to show civil parishes.

* Publication in progress.


Ghubbet
Kharab

The

Geographical Journal.

No. 4. OCTOBER, 1901. Vol. XVIII.

THE ANTARCTIC VOYAGE OF THE "BELGICA" DURING THE YEARS 1897, 1898, AND 1899.*

By HENRYK ARÇTOWSKI, of the Scientific Staff of the Expedition.

Since the date of the memorable voyages of Ross, Wilkes, and D'Urville, the record of antarctic discovery tells us of very few enterprises of the kind for many years subsequently, not a single important step having been taken, after these voyages, towards the improvement of our knowledge of the antarctic, until the moment when the *Challenger* pushed forward, as far as the polar circle, among the ice of the Southern ocean. After this came the years in which Prof. Neumayer and Sir John Murray devoted themselves to the task of arousing the interest of the scientific world in antarctic questions, and stirring it up to new efforts. In this they at last succeeded, for it is doubtless in great measure due to their advocacy that a new era of research has now begun.

On the eve of the departure of the National Antarctic Expedition, organized under the joint auspices of the Royal Society and the Royal Geographical Society, as well as of those to be sent out from Germany, Sweden, and Scotland, I wish to describe to you the doings of the Belgian Antarctic Expedition, a member of which I had the honour to be, and which was the first to winter amidst the ice of the south pole—the first of the several expeditions whose combined harvest of scientific results is destined to effect a complete revolution in our knowledge of the antarctic regions.

Now that the continent of Africa has been traversed in all directions, now that the centre of Asia is already well known in the broad outlines of its geography, while there is no longer a possibility that

* Read at the Royal Geographical Society, June 24, 1901. Map, p. 464.

anything essential can be added to our geographical knowledge by voyages to the north pole, the efforts of explorers must inevitably tend to disclose to us the mysteries of the "Terra Australis incognita." It is not merely the inaccessible or almost inaccessible coasts of the antarctic continent which have to be explored, but the whole broad expanse of ocean which bathes the lands of the south pole as well. And we can form no estimate what philosophic conclusions will be reached from the mass of new information to be gathered from the scientific exploration of so vast an extent of the surface of the globe. We must steadily advance, and history will teach us how much more important, for the whole future of the human race, are the pacific conquests of science than all the wars of destruction waged between nations in arms. I sincerely hope that the British Antarctic Expedition may meet with full success, and bring back a rich harvest of new scientific facts. And since this expedition is bound for a region not far removed from that in which we laboured, and as the *Discovery* may perhaps be blocked in the ice and winter in the pack as the *Belgica* did, I think that you will be particularly interested in hearing of the life that we lived amidst the ice during the long months in which the vessel remained imprisoned.

I will give but a very brief narrative of the voyage of the *Belgica*, for I wish also to dwell on the researches undertaken by the members of the Belgian Expedition and on the value of the observations brought back. The study of these materials involves the collaboration of a large number of *savants*, and it will therefore be impossible, until several years have elapsed, to form a clear idea of the results obtained, for up to the present two or three memoirs only have been completed.

The object of the Belgian Antarctic Expedition was *not* to pass the extreme points reached by Ross and Weddell. We aimed, on the contrary, at achieving something new—something which might better meet the requirements of modern geography, which year by year asks more of the co-operation of the natural and physical sciences. For this reason the *Belgica* was equipped for scientific work, to the end that at least some of the numberless questions awaiting solution in the antarctic, in the domain of all the sciences affiliated to geography, might be answered.

As regards the area yet unexplored, there is no doubt that the inscription "Antarctica terra incognita" will long remain inscribed in large letters in our atlases, but little by little the outlines of the southern lands will take more definite shape, and our knowledge of the southern continent—of which the existence is still enigmatical—will in time be satisfactory. The Belgian Antarctic Expedition will mark the first step, among contemporary enterprises, in lifting the veil of obscurity from the south polar ice-cap.

1. *Organization of the Expedition.*—The expedition in the *Belgica* was

a private undertaking subsidized by the Belgian Government. The initiative was due to Commander de Gerlache, who, from 1894 onwards, had entertained a wish to undertake a voyage of exploration to the south pole. This wish he expressed to various persons, including among others certain members of the Council of the Royal Belgian Geographical Society. It was one of these latter—M. Lancaster, I believe—who suggested to de Gerlache the plan of a scientific voyage, in the place of one of adventure—an idea which made its way in course of time. M. de Gerlache encountered difficulties from the very beginning. A scheme submitted to his Majesty King Leopold failed to gain his approval, and the original application for a grant of 800,000 francs (£32,000) yielded to a more modest programme involving an outlay of £12,000 only—with which comparatively small sum de Gerlache succeeded in covering the whole cost of the enterprise. Early in 1896 the Brussels Geographical Society, which gave its patronage to the project, organized a national subscription. The first 25,000 francs (£1000) were subscribed by M. Ernest Solvay, the well-known patron of research. Other important gifts, with subscription lists opened by local committees in the principal Belgian towns, the proceeds of lectures, fêtes, etc., helped the sum total to rise by degrees, while at the end of June, 1896, the sum of £4000 was unanimously voted by parliament. In spite of this, however, want of funds delayed the preparations, and the departure of the expedition was put off for a year. The vessel chosen was the smallest of the Norwegian whalers, formerly the *Patria*, which was purchased by de Gerlache for the sum of 70,000 francs (£2800). Although of recent construction, the *Patria* underwent some necessary repairs and alteration of fittings for the new services demanded of her. On July 5 the vessel was rechristened with the name *Belgica*.

The ship was a three-masted barque, 100 feet long, with a displacement of 250 tons, and auxiliary engines of 150 horse-power. The hull was protected by a casing of hard wood, to add strength and afford protection against the friction of the ice. Aft, on the deck, were placed the cabins of the officers and of the scientific staff, while in the fore part, under the bridge, a laboratory was rigged out. While these preparations were being made at Sandefiord, in Norway, the complete scientific equipment was ordered from the best makers in Europe, and our instruments were thus brought together from Paris, Vienna, Copenhagen, London, Berlin, Jena, etc. The purchase of stores, furs, and the whole equipment of the polar explorer likewise required much time and forethought. Even though we had more than a year at our disposal for these preparations, time fell short in the end, and in spite of all our efforts it was necessary to put off the date of departure. Funds, too, were lacking, for it soon became evident that the 233,000 francs (£9320) collected were not sufficient, and it was only on the Government again coming forward with a credit of

£2400 that we were able to leave Antwerp. In spite, however, of the rigorous economy which de Gerlache was forced to practise in order to keep the expenses within the scanty limit of the £12,000, a sufficient sum was devoted to the scientific instruments to save the expedition from any criticism on this score. It is true that the staff of the expedition received no remuneration, and that the wages of some of the crew were insignificant, while others were volunteers. It is equally true that the Belgian Expedition owed a debt of gratitude to many kind friends. Thus during the stay of the ship at Antwerp Mme Osterrieth took so lively an interest in the welfare of each of us that the crew of the *Belgica*, and, later, the whole of Antwerp, applied to her the title of "la mère antarctique." It was due to our President, Sir Clements Markham, and to the interest in the expedition taken by Sir John Murray, that we obtained from the Royal Society the 'Reports of the Voyage of the Challenger,' and from the Admiralty the whole series of nautical charts which were such a necessary part of the equipment of the expedition.

The *Belgica* left Antwerp on August 16, 1897. An accident to the machinery forced us to put into Ostend, and thus delayed our departure by a week, as we only left Ostend at 8 p.m. on the 23rd. One of my good friends, Antoni Dobrowolski, took advantage of this first mishap to embark with us. Two days before we left Antwerp he had come to bid me good-bye, and to inspect my arrangements. Like so many others, he saw over the *Belgica*, and even mounted into the crow's nest to obtain a general view of the Antwerp dock, and at last, when evening came, he disburdened himself of the question which had been on his mind the whole time, What should he do to be taken along with us? The thing was impossible; it was too late. Dobrowolski was a student at the University of Liége, and he would have had some difficulty in returning to collect his baggage and getting back to the ship in time; besides, the commander might perhaps not have accepted him; and, lastly, there was not another berth in the ship, all the beds being occupied.

But, directly we reached Ostend, I telegraphed to him, and he started off at once with two small packages, which he carried in his hand, and which were all he took with him for the long voyage which he meditated making. He came on board, and set to work with the rest of us on the final preparations for the voyage and the arrangement of the laboratory, which, at the moment of sailing, had not yet been completely set in order. The commander was surprised to see an extra hand on board, but, seeing that he was by no means *de trop*, decided to take him with us as laboratory assistant. Dobrowolski, as it turned out, rendered incalculable services to the expedition, for he carried out a good half of the hourly meteorological observations, and he made excellent notes on the clouds and on the phenomena of frost and snow.

It was also during these last days that our two best sailors—the Norwegians Knutsen and Johansen—were engaged in the place of two others who had left the ship. Now, too, the question of the medical officer was settled, for at the last moment we found ourselves without a doctor on board, the last of the three Belgian doctors who had been engaged having calmly remained at home after mature reflection. It was by means of the telegraph that Dr. Cook, of Brooklyn, arranged to go with us, and as there was no time for him to come to Europe, he joined us at Rio de Janeiro. These facts, and many others which I could cite, show how difficult it is to organize an expedition when one's resources are limited. It is true that there is no lack of volunteers. Each day of our stay at Antwerp people came asking to be taken with us, and de Gerlache received several hundred applications by letter, but these were for the most part from adventurers who had no idea of hard work, and who would have been incapable of rendering us the least service. Lunatics too were among the number of those who wished to embark on our ship, which every one came to see from curiosity. In three essential points the organization of the expedition was defective. Firstly, there was no written contract as between the staff and the leader of the expedition, and the functions of the several members were not sufficiently defined. Secondly, no written instructions were provided either by the Belgian Government, or by the Geographical Society, or by any other learned body. And, thirdly, no definite programme for the voyage had been drawn up.

The Belgian Antarctic Expedition maintained, therefore, the character of a private enterprise, in which the individual liberty accorded might easily have led to anarchy on board. If I lay stress on this point, it is because I feel that the example of the *Belgica* ought not to be followed. In a similar expedition, it is requisite not merely to make a good choice of the individuals who are to take part in it, but to do all in one's power, from the outset, to secure a proper organization, to define the duties of each one of the staff, so as to give stability to the enterprise, and, further, to provide a definite plan—just what we lacked.

2. *Ostend to Punta Arenas.*—The speed of the *Belgica* under steam being only from 4 to 5 knots, the crossing of the Atlantic was slow, and was of little interest. We neither sounded nor fished, so that the whole of the scientific work was comprised in the study of the surface water, from the point of view of temperature, colour, and density, and in the meteorological observations taken every two hours. In the Bay of Biscay we had very bad weather and a contrary wind, by which our progress was much hindered. The vessel was, besides, so overloaded that the deck was scarcely 2 feet above the water-line. Our situation was thus scarcely reassuring, and we congratulated ourselves when we had doubled Cape Finisterre. On September 11 we were at the port of

Funchal, Madeira, our first point of call, at which we spent three very pleasant days. Thence we sailed direct for Rio de Janeiro, where we remained a week, starting for Montevideo on October 30. At the entrance of the Rio de la Plata we were stopped by a "pampero," which blew with such violence that the captain felt it necessary to cast anchor in a little sheltered bay near Cape Polonio. On November 11 we were in Montevideo roads, and three days later we once more set our course for the south. On the 26th a storm compelled us to close reef, which caused a fresh loss of time. Finally, on November 29 we entered the Strait of Magellan, where, after halts at Cape Gregory and Elizabeth island, we cast anchor at Punta Arenas on December 1. Punta Arenas was the starting-point of our antarctic voyage. Here the commander took on board the coal necessary for the remainder of the voyage, and, profiting by a liberal offer on the part of the Argentine Government, modified his proposed route so as to complete his supply at the depôt of Llopotaia, in Beagle channel. It was this circumstance which gave us the opportunity of visiting the channels of Tierra del Fuego. Our departure was delayed by several desertions among our Belgian seamen, and we left Punta Arenas with a quite insufficient crew. The whole complement of the *Belgica* was thus reduced to nineteen men, viz. the following:—

Adrien de Gerlache, commanding; Georges Lecointe, second in command, and Roald Amundsen, officer; Emile Danco, Emile Racovitza, Henryk Arçtowski, and Antoni Dobrowolski, scientists; Frederick A. Cook, doctor; Henri Somers and Max van Rysselberg, engineers; Tollewsen, Melaerts, Johansen, Knutsen, Koren, Wiencke, Michotte, Dufour, Van Mirlo, seamen.

3. *Among the Channels of Tierra del Fuego.*—We took advantage of our stay at Punta Arenas to make some excursions in the neighbourhood. We went into the valley of the Rio las Minas, where a fine series of sections in the Tertiary sandstone and sand is to be seen. Here and there they contain fossils as well as deposits of lignite, one of which is worked. There are some gold-washers at work on the river, but the outturn is extremely small. Afterwards Dr. Cook and I visited the sheep farm at Pecket Harbour, where I was able to examine some fine moraines, which seem to mark the termination of the Magellanic glacier, and which must, I think, have been formed beneath the surface of the sea before the upheaval of that part of Patagonia. We likewise inspected the Catholic mission on Dawson island, where Cook was able to carry out some anthropological measurements among the Fuegians of the Onas tribe, whilst I took some linguistic notes.

In order to pass round Tierra del Fuego, the *Belgica* traversed Magdalena sound and Cockburn channel. We did not get sight of Mount Sarmiento, which was lost in the clouds, but we looked with

admiration on the superb glaciers which descend from the spurs of this mountain *massif*, some of which discharge themselves into the waters of the channel. At the entrance to Darwin channel we put into a small bay on Londonderry island, and on the opposite (Fuegian) side of the channel into a fine fiord, at the head of which debouches an immense glacier from the slopes of Mount Darwin. Here and there we saw well-preserved traces of the former extension of the glaciers. Thus, on Londonderry island, the entrance to the small bay, in which we had cast anchor, was fringed on both sides with fragments of moraines, one of which ran out in the form of a natural jetty.

A little above sea-level a lake occupied the bottom of the valley which debouched into the bay. This lake discharged by a torrent, the bed of which had been cut down into the rock of the sill which separated it from the bay. On the precipitous walls which bounded the funnel, at the bottom of which the lake lay, there were *roches moutonnées*; and higher up, above a second sill, was another smaller lake, which also seemed to occupy a basin hollowed out of the rock. In the Pleistocene period this valley must certainly have been occupied by an immense glacier. From the summit of a mountain 2300 feet high, I could make out that the whole of O'Brien island, which we had opposite us, was likewise strewn with small lakes ranged in line in accordance with the direction of the valleys. Other funnel-shaped hollows which we had seen from the deck of the *Belgica* while passing through Cockburn channel suggested to me that there must be lakes occupying basins abandoned by the ice on the retreat of the Pleistocene glaciers. They thus seem to form one of the characteristics of the region.

The bay of the great glacier on Tierra del Fuego is a superb fiord, into which we advanced as far as was possible, effecting landings at several points in order to study the flora and the geology. Three large transverse moraines divide the fiord into basins. The third moraine leaves only a narrow passage of no great depth, so that the last basin, into which the glacier debouches, is entirely packed with floating ice. It formed miniature icebergs, only the smallest of which can be carried by the current into the fiord and thence into Darwin channel. The doctor and I did our best to make our way to the glacier, which is truly magnificent. We climbed the heights, where we had to hug the extremities of several small hanging glaciers, and climb steep rocks, for along the margin of the basin there is no beach, while the cliffs are mostly precipitous, and to have forced a way among the ice in a canoe would have been an impossibility. In the end we were stopped by a river which flows from a lateral valley, and which we made no attempt to cross, the distance still separating us from the great glacier being too considerable and the ground virtually impassable.

The transversal moraines are not the only indications of the ancient

extension of the great glacier. They rather mark with great clearness the stages of a rapid retreat of this immense river of ice at the close of the glacial epoch. The sides of the mountains which border the fiord bear *roches moutonnées* at considerable altitudes, and one of the mountains has the characteristic outline of a huge sheep's back surmounted by a small hillock. This latter has sharp ridges, whilst all the rest of the mountain is polished and planed by the erosive action of the ice. I have no doubt that during the glacial epoch it was a nunatak rising above the surface of the inland ice which covered the Darwin mountains, and which certainly reached to this point. It was not merely, therefore, the head of the fiord which was blocked with ice, but the whole of this immense valley was buried in this outpouring of the inland ice, until only a few of the mountain summits remained above the surface of the icy mantle.

In Darwin channel we once more cast anchor, in a small bay named by the expedition Asterias bay, from the large number of crustacea collected there by Racovitza. Thence we proceeded direct to Ushuwaia in Beagle channel, whence the *Belgica* went on to Llopotaia fiord in order to take in coal. I went across the forest on foot, accompanied by two Indians, while Dr. Cook remained at the Protestant mission at Ushuwaia to make an anthropological study of the Yahgans. The scenery of Llopotaia fiord is grand. At its head rises a mountain, called the "Bonnet de la République," from the snowy cap which covers the summit; while quite on the horizon, through the wide opening afforded by a valley, the Darwin mountains can be clearly seen in fine weather, with the Pic des Français in front. These mountains are entirely unexplored, and even Lake Acigami, which ends at the settlement of Llopotaia, has never been visited. It was impossible, for want of time, to penetrate as far as the Darwin range, or even to ascend the Martial mountains, which rise just abreast of Beagle channel.

After returning to Ushuwaia, the *Belgica* proceeded to Harberton harbour, where we met with an accident which came near putting an end to the expedition. The *Belgica* struck a submerged rock, on which she remained fast. At low water the ship completely heeled over, and a storm that supervened added still more to the danger of our situation. But, fortunately, the swell that arose, and eventually became very strong, finally lifted the *Belgica* off the rock, after having beaten her against it for several hours. It was most astonishing that our ship had the strength to resist so many violent shocks, and the result was that, far from discouraging us, this accident only gave us confidence for the future.

As soon as liberated, it was in complete disorder on board that we made the best of our way to a good anchorage in which to take shelter. The captain cast anchor in Port Toro, on Navarino island, where we passed the night, and on the following day went back

again to Harberton harbour to take on board Dr. Cook, who had landed, and after a short stay, we started for Staten island. Our putting in here was rendered necessary by the fact that when aground near Harberton, we had been obliged to pump out all our stock of water to lighten the vessel, and, having been told that the water at John harbour was good and abundant, we seized the opportunity of visiting Staten island, which is of especial interest from a geographical point of view. The Admiralty chart shows that the form of this island is most curious. It is long and narrow, cut up by fiords and bays, and forms, in fact, a chain of mountains with a much broken relief, due to the powerful erosion to which it has been subject. But its base is wanting, and the sea encroaches everywhere on the bottoms of the valleys, so as to cut up the island into separate fragments. It is the skeleton of a mountain range emerging but slightly above the level of the sea.

Staten island forms one of the extremities of the Andes, which, curving towards the east, encloses within its bend the plains of Tierra del Fuego, while on the opposite side it falls steeply to the ocean. The chain of the Andes seems to open in the form of a fan, for if Staten island forms the prolongation of the Darwin and Martial ranges, there is another important ridge which runs south and ends at Cape Horn; and possibly also a third and outermost one, which extends to the islands of Diego Ramirez. It seems to me a natural question to ask if this is really the end of the great chain of mountains which borders the whole Pacific side of South America, or whether, on the contrary, the chain is prolonged in the form of submarine ridges beyond these limits. The existence of Burdwood bank shows us that the base on which Staten island rests is continued to the 53rd degree of longitude, but how is it to be traced beyond this point? Is it connected directly with the South Orkneys, or is the arc still wider, and do South Georgia and the chain of the Sandwich isles belong to the same system? Even before our departure I had been much puzzled to know in what direction the prolongation of the Andes was to be sought, and how the range was connected with the framework of the Antarctic lands situated south of the southernmost point of America, *i.e.* with the volcanic chain of the South Shetlands and Orkneys, and the great range which traverses the lands discovered by Palmer, Ross, and d'Urville, and is continued southward in Graham Land and Alexander Land, and, no doubt, further still towards the south, possibly as far as Mounts Erebus and Terror. And I am now still more puzzled than ever to know the correct solution of this problem of terrestrial morphology.

At the extremity of John harbour, where we anchored, I discovered glacial traces. There were morainic materials, and on the prolongation of the fiord there was a lake bordered by a moraine, while further up there was still another basin excavated in the rock. One of the employés at the lighthouse in John harbour, who has lived several

years on Staten island, assured me that there are many lakes among the heights, and pointed out the position of several of them on the map. At the present day there is not a single glacier on the island, but the traces of ancient glaciation explain clearly the peculiarly characteristic features of its relief.

The *Belgica* left Staten island on January 14, 1898, and it was from this date that our voyage of exploration began. As I have already stated, we had all the equipment necessary for oceanographical investigations, and I was happy to be able at last to commence my researches, which began with an interesting discovery. South of Staten island, in the latitude of Cape Horn, the sounding-lead only touched bottom at 2200 fathoms, and from this point the depths gradually diminish towards the south. It is, therefore, towards the east that I think we must look for the prolongation of the Andes, since south of Cape Horn we are still in the Barker basin. The Pacific ocean ought, therefore, to be extended beyond the meridian of Cape Horn, for its natural limit will certainly be found in the submarine ridge of the Andes.

4. *The Antarctic Lands.*—It was on January 23 that we reached Hughes gulf, the outlines of which are but vaguely traced on the Admiralty chart, from the indications supplied early in the nineteenth century by English and American whalers. We soon saw that the modern charts of Petermann and Friederichsen, intended to illustrate the discoveries of the German Captain Dallmann, were entirely at fault. As the information respecting the lands situated to the south of Cape Horn was extremely scanty, it was with pleasure that we all worked our hardest to collect such *data* as should be obtainable on the nature and extent of these lands. Captain Lecointe, assisted by Commander de Gerlache, was busy from morning till night on survey work, the *Belgica* being moved from place to place in order that all the details of the coast might be seen from near at hand; Dr. Cook was constantly at work taking photographs; Racovitza took notes on the animals and plants which he managed to collect; while I took every opportunity of landing to collect specimens of the rocks and study the glaciers of this region, besides taking numerous photographs.

Our geographical discoveries are already well known, and I will, therefore, not dwell in detail on our zigzag course through Belgica strait, which can be followed in my article on the Antarctic Lands published in the February number of the *Geographical Journal*. The chart constructed by Captain Lecointe gives an idea of the work accomplished during the three weeks devoted by the expedition to cartography, for it was on February 13 that we left the newly discovered lands to push our way south through regions until then completely unexplored. The important point which is brought out by Lecointe's map, is that the east coast of the strait traversed by us is perfectly continuous, and that its contours display the characteristic features of a region of fiords. Towards

uth this land (named by us Danco Land, in memory of Lieut. Emile
), who died during the course of the expedition) is connected with

FIG. 1.—CAPE ASTRUP: WIENCKE ISLAND, SEEN FROM NEUMAYER CHANNEL.
(Photo by Arçtowski.)

FIG. 2.—SPECIAL FORMS OF GLACIERS SEEN ON WIENCKE ISLAND.
(Photo by Arçtowski.)

am Land, the northern extremity of which was likewise explored
. Towards the north, on the contrary, the continental coast-line
not traced by the expedition, for this would have necessitated

retracing our steps, while, the season being already far advanced, we had to continue our onward voyage to the south. But as the inland ice rises to a very considerable height east of Hughes inlet, I have been led to believe that land must reach in that direction as far as Louis Philippe Land. It therefore seems likely to me that the coast-line is continuous to that point, and that Louis Philippe Land is in reality the northern termination of Graham Land, and that the "New Greenland" of the first explorers of this region is not a phantasm. The large islands situated to the west of Belgica strait form an archipelago, which has been named Palmer archipelago, in order to give a place on the maps to the name of this intrepid American navigator.

It has been asserted that the discoveries of Palmer were nothing but a fable, and that the account of them given by Fanning * is mere imagination. Fanning writes as follows:—

"After the *Hersilia's* return from the South Shetlands, a fleet of vessels, consisting of the brig *Frederick*, Captain Benjamin Pendleton, the senior commander, the brig *Hersilia*, Captain James P. Sheffield, schooners *Express*, Captain E. Williams, *Free Gift*, Captain F. Dunbar, and sloop *Hero*, Captain N. B. Palmer, was fitted out at Stonington, Connecticut, on a voyage to the South Shetlands. From Captain Pendleton's report, as rendered on their return, it appeared that while the fleet lay at anchor in Yankee Harbor, Deception Island, during the season of 1820 and 1821, being on the look-out from an elevated station, on the mountain of the island during a very clear day, he had discovered mountains (one a volcano in operation) in the south; this was what is now known by the name of Palmer's Land. From the statement it will be perceived how this name came deservedly to be given it, and by which it is now current in the modern charts. To examine this newly discovered land, Captain N. B. Palmer, in the slope *Hero*, a vessel but little rising forty tons, was despatched. He found it to be an extensive mountainous country, more sterile and dismal, if possible, and more heavily loaded with ice and snow, than the South Shetlands. There were sea-leopards on its shore, but no fur seals; the main part of its coast was ice-bound, although it was in the midsummer of this hemisphere, and a landing consequently difficult.

"On the *Hero's* return passage to Yankee Harbor she got becalmed in a thick fog between the South Shetlands and the newly discovered continent, but nearest the former. When this began to clear away, Captain Palmer was surprised to find his little barque between a frigate and sloop of war, and instantly ran up the United States flag; the frigate and sloop of war then set the Russian colors. Soon after this a boat was seen pulling from the commodore's ship for the *Hero*,

* Edmund Fanning, 'Voyages round the World, with Sketches of Voyages to the South Seas' (New York, 1833), p. 434.

and when alongside, the lieutenant presented an invitation from his commodore for Captain P. to go on board; this of course was accepted. These ships, he then found, were two discovery ships sent out by the Emperor Alexander of Russia, on a voyage around the world. To the commodore's interrogatory if he had any knowledge of those islands then in sight, and what they were, Captain P. replied he was well acquainted with them, and that they were the South Shetlands, at the same time making a tender of his services to pilot the ships into a good harbour at Deception Island, and nearest by where water and refreshments such as the island afforded could be obtained. He also informed the Russian officer that his vessel belonged to a fleet of five sail out

FIG. 3.—A ROOKERY OF SMALL PENGUINS, PYGOSCELIS PAPUA.
(*Photo by Racovitza.*)

of Stonington under command of Captain B. Pendleton, and then at anchor in Yankee Harbor, who would most cheerfully render any assistance in his power. The commodore thanked him kindly. 'But previous to our being enveloped in the fog,' said he, 'we had sight of those islands, and concluded we had made a discovery; but behold, when the fog lifts, to my great surprise, here is an American vessel apparently in as fine order as if it were but yesterday she had left the United States; not only this, but her master is ready to pilot my vessels into port. We must surrender the palm to you Americans,' continued he, very flatteringly. His astonishment was yet more increased when Captain Palmer informed him of the existence of an

immense extent of land to the south, whose mountains might be seen from the masthead when the fog should clear away entirely. Captain Palmer, while on board the frigate, was entertained in the most friendly manner, and the commodore was so forcibly struck with the circumstances of the case that he named the coast then to the south Palmer's Land.* By this name it is recorded on the recent Russian and English charts and maps which have been published since the return of these ships. The situation of the different vessels may be seen by the plate; they were, at the time of the lifting of the fog and its going off to the eastward, to the south, and in sight of the Shetland Islands, but nearest to Deception Island. In their immediate neighbourhood were many ice islands, some of greater and some of less dimensions, while far off to the south the icy tops of some two or three of the mountains on Palmer Land could be faintly seen. The wind at the time was moderate, and both the ships and the little sloop were moving along under full sail."

This meeting was also described by Bellingshausen himself, as can easily be seen by consulting the remarkable, but still little-known work of that eminent Russian explorer.†

Further on we read ‡—

"The following season, in 1821 and 1822, Captain Pendleton was again at Yankee Harbor, with the Honington fleet; he then once more despatched Captain Palmer in the sloop *James Monroe*, an excellent vessel of upwards of 80 tons, well calculated for such duties, and by her great strength well able to venture in the midst of and wrestle with the ice. Captain Palmer reported on his return, that after proceeding to the southward, he met ice fast and firmly attached to the shore of Palmer's Land; he then traced the coast to the eastward, keeping as near the shore as the ice would suffer; at times he was able to come along shore, at other points he could not approach within from one to several miles, owing to the firm ice, although it was in December and January, the middle summer months in this hemisphere. In this way he coasted along this continent upwards of fifteen degrees, viz. from 64 and odd down below the 49th of west longitude. The coast, as he proceeded to the eastward, became more clear of ice, so that he was able to trace the shore better. In 61° 41′ south latitude, a strait was

* "This continent," it is asserted in Morrell's 'Voyages,' p. 69, "was named 'New South Greenland,' by a Captain Johnson. It is but just to state here, that this most meritorious mariner (Captain Johnson) was a pupil to, and made his first voyage to the South seas with, the author, with whom also he remained, rising to different stations, and finally became one of his best officers. The first information he obtained of the discovery of this land by Captain Pendleton and Palmer was from the author of this work."

† 'Dwukratnyja izyskanija w jushnom Lèdowitom okeanie' (St. Petersburg, 1831), vol. ii. pp. 263, 264.

‡ Fanning, p. 438.

discovered [South Orkneys], which he named Washington Strait; this he entered, and about a league within, came to a fine bay which he named Monroe Bay. At the head of this was a good harbor; here they anchored, calling it Palmer's Harbor. The captain landed on the beach among a number of those beautiful amphibious animals, the spotted glossy-looking sea-leopard, and that rich golden-colored noble bird, the king penguin. Making their way through these, the captain and party traversed the coast and country for some distance around, without discovering the least appearance of vegetation excepting the winter moss. The sea-leopards were the only animals found; there were, however, vast numbers of birds, several different species of the

FIG. 4.—OSSIFRAGA GIGANTEA. SEVENTEENTH LANDING, BOB ISLAND.
(*Photo by Arçtowski.*)

penguin, Port Egmont hens, white pigeons, a variety of gulls, and many kinds of oceanic birds. The valleys and gulleys were mainly filled with those never-dissolved icebergs, their square and perpendicular fronts, several hundred feet in height, glistening most splendidly in a variety of colors as the sun shone upon them. The mountains on the coast, as well as those to all appearance in the interior, were generally covered with snow, except when their black peaks were seen here and there peeping out." *

* This second part is evidently exaggerated, the discovery and the cartography of the South Orkneys being the work of Powell. Their discovery is described by Powell himself in the *Journal des Voyages, découvertes et navigations modernes ou Archives Géographiques du XIX^e. siècle*, tome xxii. (Paris, 1824), p. 93: "Extrait du journal du voyage du capitaine Powell, à South-Shetland, pendant les années 1821 et 1822."

It is to be regretted that after the voyage of the German whaling captain Dallmann, the German "armchair geographers" devoted themselves so keenly to the cartography of this region that they did not hesitate to criticize the map of Lecointe, and, in *Petermanns Mitteilungen*,* to treat de Gerlache as an ignoramus. Taking advantage of the fact that Smiley, in 1842, effected a circumnavigation of Palmer archipelago, they indulged in unlimited speculation on Dallmann's *Notes de Voyage*, and "discovered" the King William archipelago and Bismarck strait, which, according to circumstances, can either stretch south-east, east, or north, and which is also the *raison d'être* of that other unfortunate innovation, the Dirk Gerritsz archipelago. Now, the fragments of Dallmann's Journal, which have been published, in no way permit the conclusions necessary for the construction of a new map, and in my opinion the Admiralty—whatever they may say in Germany—has done quite right to pay no attention to the elaborate maps of Friederichsen and Stieler's Atlas. The King William islands are, as a matter of fact, nothing but a part of the Biscoe islands, placed, with exaggerated dimensions, much too far to the east, far inland. As to the strait, Dallmann could not, from his position, have seen anything other than the entrance to the great fiord called by de Gerlache, Flanders bay. Besides, Dallmann, who navigated Hughes gulf, clearly describes Hughes inlet (of Lecointe's map), but, not having advanced sufficiently far, did not discover the northern entrance of Belgica strait. Therefore, if, as is contended in *Petermann's Mitteilungen*, the name Belgica strait ought to have no place on the map, it is Smiley's name that ought to be inserted, rather than that of Prince Bismarck, who never made a voyage of discovery.

There is one other point to which I wish to call attention. Demas, one of Dumont d'Urville's officers, says † that he noticed that Orléans channel extended towards the south-west. It may well be, therefore, that Dallmann passed through Orléans channel, when he discovered that Trinity land was an island. Trinity island is, therefore, the last large island of Palmer archipelago.

The general map of the lands to the south of America must, as we have just seen, be drawn quite differently from its delineation by the Germans. We have there a large peninsula (of the antarctic continent,

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On page 111 we read in a note, "On ne peut dire que fort peu de chose sur la terre du S., appelée Palmer's land, attendu qu'elle n'a pas été suffisamment explorée; mais on la représente comme fort elevée et toute couverte de neige. On y voit aussi des entrées en forme de détroits, qui divisent probablement la terre, et constituent des rangées d'îles semblables à celles de South Shetland. Tel est, en un mot, l'aspect de la côte N., qui seule a été aperçue."

* *Pet. Mitt.*, 1900, p. 172; 1901, p. 48.

† Dumont d'Urville, 'Voyage au Pôle Sud et dans l'Océanie' (Paris, 1842), vol. i., 2de partie, p. 338.

if such a continent exists), which terminates northward in a point facing north-east. A series of islands fringe this land on the side of the Pacific. They are, first Biscoe islands, and further north the Palmer archipelago. Another archipelago (the South Shetlands), forming a well-marked chain of mountains, stretches for some distance to the north in a north-east by east direction. It is noteworthy that taken as a whole these lands present a striking analogy with the southern extremity of America, and as the Andes are continued towards the east, so also the mountains which form the backbone of these southern lands reappear above the level of the sea a little to the east of the South Shetlands, in the South Orkneys.

The antarctic lands which we visited are very mountainous, and the mountains reach to the shores almost everywhere. The region of Belgica channel bears the characters of a depressed area, so much so that in spite of one's self one is driven to the conclusion that the whole block has sunk into the sea, under the pressure produced by the accumulation of ice, to a depth sufficient to restore equilibrium. By reason of this ice, which seems to be piled up in quantities almost as great as the extent of the lands permits, the relief of the ground is almost completely masked. Still there are valleys blocked by immense streams of ice, and in these valleys there must be sills, since ice-falls are to be seen here and there. Cirques too occur; so that we find all the forms characteristic of fluviatile erosion, and I feel no doubt at all that before the glacial epoch this region was clear of ice, and that the traces of relief noticed were produced by running water. This relief can, however, be only guessed at, at the present day, for the eternal snows have accumulated everywhere, and it is only by the directions of the glaciers and the external forms of the snow-fields, as well as by the crevasses, that we can picture to ourselves the form of the ground on which these ice-masses rest.

Still, it is possible to trace some of the broad lines of the irregularities of the relief, due to tectonic causes. The two principal islands of Palmer archipelago are traversed in the direction of their length by a chain of mountains having a well-defined direction from south-west to north-east, with, I believe, a gentle curvature to the east. The Biscoe islands certainly form the southern prolongation of this chain, while Trinity island is possibly that to the north-east. Moreover, from the few geological data which I could collect, this line of mountains forms likewise a zone of ancient eruptive rocks, with one or more volcanoes of tertiary, or possibly even of recent date. Wiencke island and the northern point of the coast of Graham Land form a similar chain which runs in a direction parallel to the first. As regards the mountains of Danco Land, they form more important *massifs* of granites, metamorphic and sedimentary rocks, while further inland there are also some masses of gneiss, as is shown by the erratics derived from that part of the country.

I am led to believe that the more detailed study of the geology of this "New Greenland" of the first navigators will bring to light analogies between the mountain system of these lands and that of the chains which form the southern extremity of the Andes, and that we are now in a position to formulate and discuss the theory of the "Antarctic Andes." The petrographic study of the rocks which I brought back will give us some data to work from. I propose to call this system of mountains the Copernicus range, and in this way to introduce, into our geographical maps, the name of the immortal Polish astronomer.

5. *The Antarctic Glaciers.*—The glaciers of the antarctic lands visited by the expedition are very characteristic, and differ so completely in appearance from the alpine, or even the arctic glaciers, that it would be difficult to describe them in a few words. The line of perpetual snow running very close to the level of the sea, and in places even at that level, one of the special features of glaciers, which is quite the rule in the case of those of the Alps and arctic regions, is completely wanting to the antarctic glaciers. The terminal portion of the ice-stream—that in which it is laid bare and melts under the influence of solar radiation and the higher temperature of the lower regions to which it has descended—which we have come to regard as quite characteristic of glaciers, is altogether or almost entirely absent. To their very extremities they are, in fact, included within the region of accumulation of snow—the zone in which they are continually enriched by the contributions made by atmospheric precipitation. This fact alone permits the occurrence on the antarctic lands of special types of glaciers, the most remarkable of which is that of ice-caps. The study of the alpine glaciers has led geologists to distinguish only the three forms of "valley glaciers," hanging or "corrie glaciers," and "regenerated glaciers." The idea of a glacier thus presupposes the presence of a valley. This idea is a mistaken one, for it is quite possible that the ice-stream may be wanting. This is the case in the Antarctic whenever it happens that the collecting-ground is sufficiently near the coast for the glacier to terminate at its greatest breadth in an ice-wall. In the antarctic regions perpetual snow can exist on level ground in so low a latitude as 65°, so that even small islands may bear a complete mantle of perpetual snow. On some small islets of less than a mile in diameter we found a thick accumulation of ice entirely covering the inequalities of the ground, and forming in consequence convex glaciers. These ice-caps ended seawards in perpendicular walls, whilst on the surface they took the form of huge, perfectly even sheep's backs.

It is evident that this form of glacier will be found also on islands of larger extent, whenever the relief is sufficiently uniform to make it impossible for a peak to pierce through the glacial cap. As regards the thickness of these caps, it is plain that it depends on the plasticity of the ice and the extent of ground on which it rests. To my

mind the only difference which exists between these convex glaciers of the antarctic and the inland ice of Greenland consists in the incomparably greater extent of the latter, and in the fact that this does not reach the coast, but melts up into streamlets, and sends glaciers down towards the sea only through the valleys. But it is possible that there may be a sheet of inland ice more extensive even than that of Greenland. We may say that the great ice-cap supposed by Croll * may quite well cover the antarctic continent, since even small islands are seen to have the even and convex covering of ice laid down by Croll for the whole southern continent.†

On the other hand, it may seem surprising that the glacial caps are

FIG. 5.—A CHARACTERISTIC ANTARCTIC COAST: FLAT GLACIER TERMINATED BY AN ICE-WALL, SHOWING STRATIFICATION OF THE NÉVÉ.

(*Photo by Cook.*)

not the sole type of glacier in these regions, where the line of perpetual snow is found at sea-level.‡ The reason is that most of the islands are

* 'Climate and Time,' 4th edit. (London, 1897), p. 374.

† Cf. Arçtowski, "Les calottes glaciaires des Régions Antarctiques," *C. R. Acad. Sci. Paris*, December 24, 1900.

‡ The question of the level of perpetual snow in the region of Belgica strait is a very complex one. Prof. Penck, who was present at an address that I delivered at the "Naturforscher-Versammlung" at Aix-la-Chapelle, was tempted to suppose that there might well be two lines of perpetual snow, one above the other, in that region. Low-lying fogs are, in fact, very frequent there, and these protect the snow from the effects of solar radiation, while, on the other hand, the clouds which most frequently give rise to atmospheric precipitation likewise rest very low. The summits and upper portions

too high in proportion to the area occupied by the base, and that therefore the mountains cannot fail to pierce through the coating of ice. The antarctic glaciers are not stationary, any more than those of other regions, and though they remain perpetually under the sway of winter, they still move on. The plasticity of the ice prevents its accumulation beyond a certain limit of height, and the mantles of ice must—even under extremely rigorous conditions of weather—be limited in thickness, while all the forms of the antarctic glaciers must be those of a semi-fluid mass. There are thus both ice-rivers and cascades, and also forms recalling the "corrie glaciers." But all are alike buried beneath a mantle of perpetual snow, and bare ice is nowhere seen. "Inland ice," properly speaking, does not exist on the large islands of the Palmer archipelago. On the other hand, on Danco Land and Graham Land, it is only the mountains situated near the coast which show themselves, while the whole interior of the land lying eastward is completely buried under the inland ice.

We must not, however, imagine that the antarctic lands are at the present day as heavily loaded with glaciers as they might be, for traces of a wider extension, dating doubtless from the glacial epoch, are still preserved. The presence of these vestiges of the glacial epoch seems to me remarkable for various reasons, and on this account I should like to bring forward some facts in support of my assertion. Gaston islet, our eighth antarctic landing-place, lying a mile from the coast, is a huge *roche moutonnée* perfectly polished on the surface. At the time of our visit it was almost entirely bare of snow. Opposite this islet, at Cape Reclus, there rises, along the coast, a large moraine running from north-east to south-west. An examination of the map of the lands discovered by the expedition shows that the direction of the moraine is that of Belgica strait, and we are led to the conclusion that the glacier which produced this moraine must have occupied the strait itself, which has at this point a breadth of 10 miles and a depth of 342 fathoms. Another argument is supplied by our seventeenth and eighteenth landings. On Bob islet, not far from Wiencke island, we discovered some well-preserved fragments of a moraine, from 15 to 20 feet high, resting against the sloping shore at a height of 80 feet above the sea. This moraine has the same direction as the channel, and its height decreases gradually towards the west. On it were some huge blocks of gneiss perfectly polished. The red granite is in the form of rounded boulders, and the same is the case with other rocks, while the diorite is often angular.

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of the flanks of the mountains (1000 feet and over) are therefore subject to a climatic *régime* decidedly different from that which prevails at sea-level. The mean temperature of the air is possibly lower, but on the other hand the amount of atmospheric precipation is less and the effect of radiation greater. This would explain the fact that the mountain slopes are sometimes bare of snow at an altitude of 1500 feet or even higher. It follows that the idea of two levels of perpetual snow is quite a plausible one.

On the other side of Belgica strait, exactly opposite the former spot, we discovered a fine moraine on Banck island. Its height was 65 feet, and its direction parallel to that of the strait. It rested against the sloping side of the mountain, which here displayed characteristic *roches moutonnées*. These moraines can only be explained as the product of an immense glacier which must have flowed through Belgica strait westward, *i.e.* towards the Pacific ocean. Other proofs of the former wide extent of the antarctic glaciers are furnished by the erratics collected in Hughes gulf, at our third, fifth, and sixth landings, as also by those found on Antwerp island at the fourteenth landing-place, where a bank of rolled pebbles and blocks extends for a certain distance from the shore. Further, in Errera channel, a remarkable moraine runs transversely across. Lastly, we frequently saw perfectly polished *roches moutonnées*, either along the shore-lines or on small islands.

The discovery of the former greater extension of the antarctic glaciers seems to me so important a fact to record, that I could not refrain from entering into these details. The discovery is interesting from various points of view. I will here merely call attention to a question which seems to me closely bound up with it—I allude to the climate of the glacial epoch. In fact, this question aroused a keen interest in me, from the moment when I noticed the morphologic analogy which exists between the southern extremity of South America and this northern point of the antarctic continent, and which suggests the question whether the more thorough study of the climates of the two regions and of the glaciers might not permit us to calculate the point to which the mean temperature of the air must have fallen during the glacial epoch.

This epoch has left its mark in both regions, and the aspect presented by the antarctic lands in our day seems to afford an indication of the condition of the channels of Tierra del Fuego during the glacial epoch. We are, therefore, justified in asking whether the existing climate of the antarctic lands in 64° may not be the same as that which prevailed in 54° during the ice-age.*

I am confident that the investigations of the next antarctic expeditions which may visit the two regions will furnish us with the key to the problem here indicated.

6. *Antarctic Icebergs*.—The icebergs of the arctic regions are, in general, of very varied form, and usually of small dimensions, although heights of 80 metres (260 feet) are frequently measured, and it seems that as much as 110 metres (360 feet) above sea-level may be attained.†

* H. Arçtowski, "A propos de la question du climat de l'époque glaciaire," *Ciel et Terre*, March, 1901.

† E. V. Drygalski, 'Grönland Expedition,' vol. i. p. 381.

The tabular form has rarely been recorded, although the icebergs do show it near the glaciers from which they are derived, if the slope of the glacier is slight and the berg retains its original position of equilibrium after detachment.

The antarctic, on the other hand, is the region of immense tabular icebergs. In the southern seas, bergs several kilometres in length, and rising to a height of 60 metres (200 feet), have been frequently met with; ice-islands rising to as much as 500 metres (1640 feet) have been reported, but this is obviously a gross exaggeration. Erroneous views about the antarctic icebergs are very widely held.* Heim, for example, states that they are of marine origin, formed by successive thickenings of the ice-pack.

FIG. 6.—TABULAR ICEBERG WITH GROTTOES.
(*Photo by Cook.*)

In the seas navigated by the *Belgica*, we have seen as many as a hundred and ten icebergs at once, distributed all round the horizon. Forty per cent. of these would be of the characteristic tabular form, while the remainder resembled arctic bergs, or some form derived from the tabular. Large icebergs were rare; heights of 50 metres (164 feet) were quite exceptional, and the tabular bergs averaged only 30 to 40 metres (98 to 131 feet). The tabular icebergs are covered over with *névé*, and only show the alternate blue and white bands at the base. I only once had an opportunity of examining this stratification, in an iceberg which was enclosed in the pack, and displaced so that the strata dipped at a considerable angle. Both the blue and white bands were formed of glacier ice with the characteristic grained structure; the strata were not sharply separated from one another, the only difference between blue

* A. Heim, 'Gletscherkunde,' p. 270.

and white being that the ice in the latter was more porous, enclosing a large number of air-bubbles; the ice in both was compact. The supposition that tabular bergs are formed of sea-ice is entirely wrong. The mode of formation of the sea-ice shows that its thickness constantly tends to a limit, supposed by Weyprecht * to be 7 metres (23 feet) at a maximum, however low the mean winter temperature, and however great the number of years. I think Weyprecht's limit is too great for the antarctic regions. In any case, the continental origin of the antarctic icebergs is indisputable, for the bed of the Antarctic ocean is covered with terrigenous deposits and erratic blocks laid down by the melting of the ice, and these materials are transported to great distances from the glaciers from which they are derived.

FIG. 7.—THE EDGE OF THE PACK.
(*Photo by Cook.*)

The majority of the great antarctic glaciers have a sufficiently gentle slope to produce icebergs of tabular form. It is probable, however, that most of the ice-tables do not come from these glaciers, but from the wide ice-cap which form the inland ice covering the low-lying land situated farther south. Both our soundings † and those of Ross have shown that the continental inland ice does not extend (on the continental shelf) beyond the isobath of 400 metres (1312 feet), and this may be taken as the maximum total thickness of the icebergs coming from the pole in the whole antarctic area of the Pacific. If one-eighth of the tabular icebergs appear above the surface, we get 50 metres (164 feet) as the limiting height of the bergs detached from the great ice-

* K. Weyprecht, 'Die Metamorphosen des Polareises,' p. 139.

† H. Arçtowski, "The Bathymetrical Relations of the Antarctic Regions" (*Geog Journ.*, July, 1899).

barrier known to extend from Victoria Land to long. 170° W., and which doubtless continues eastwards to the land to south and west of Alexander Land.

7. *Attempts to penetrate the Pack.*—As soon as the *Belgica* entered the Pacific ocean, the surveys of the strait discovered being completed, and the season already well advanced, Commander de Gerlache was impatient to push his way as far south as possible. He hoped to attain a high latitude, being convinced of the existence of an open navigable sea, like those discovered by Weddell and Ross, beyond the zone of the pack. We could have explored the coast of Graham Land, and we could have effected a landing on one of the Biscoe islands, which would have added materially to our knowledge of the geology of the antarctic lands. As we were in sight of Alexander Land, it would also have been easy to ascertain if this land is continuous with Graham Land; in other words, whether the apparent break between the two is a strait or only the entrance to a fjord. But de Gerlache did not wish to lose time, and set his course to south-west, in order to cross the pack, which we entered. We were already south of Bellingshausen's route, and unexplored regions lay before us to west and south. In the light of the experience gained since, it is apparent that it would have been better to have followed the edge of the pack, and to have entered the ice much further to the west; but those things cannot be foreseen, and we made our first attempt in long. 80° W. The ice was very thick, and after a few miles' navigation in the pack further progress was hopeless, and we had to turn back.

A second attempt proved equally vain. In long. 81° W., we did not reach the 70th parallel. In long. 85°, however, the edge of the pack was more to the south, and on February 27 we reached lat. 70° S. without difficulty, the ice being navigable, and, aided by a gale, we made rapid progress. Here the pack was distributed in bands of ice but little compressed, and having free spaces of varying width between, through which the *Belgica*, driven by the wind, could break a passage. Finally we came to the close pack, which was quite impenetrable. With powerful machinery we could no doubt have proceeded further, but the *Belgica* became altogether immovable in lat. 71° 30′ S., on March 2, 1898. This latitude was never exceeded later by more than a few minutes.

No serious attempt was made to escape from our imprisonment. Wintering in the antarctic regions was part of the programme of the expedition, and it was just as well to do so where we were, in the moving pack, as to force a way out and return to a land station. Besides, in the explored land regions, we had only seen one place where wintering was practicable—at the twelfth landing in Lemaire channel.

The first days of our sojourn in the ice were very trying. Everyone naturally asked himself how long we were to remain, whether we were one day to escape and return home safe and sound, or whether

the pressure of the ice would crush our vessel, with consequences no one could foresee; every one regretted the work unfinished, and feared for the loss of the materials and observations already collected. But we became accustomed to our surroundings very quickly. On March 6, Amundsen, Cook, and I left the ship, and, going from one floe to another by jumping the narrow open channels between, made our first excursion. The weather was fine, and it was a pleasure to risk a visit to an iceberg, which, like ourselves, was a prisoner in the pack. The floes were small, and constantly moving, so that the recurring risk of jumping short and falling into the water added a spice of adventure to our journey. But all went well, and a very agreeable day gave us confidence in ourselves and hope that we should not lack means of amusement.

The seals and penguins were our very good comrades from the

FIG. 8.—ATTEMPT TO PENETRATE THE PACK.
(*Photo by Arçtowski.*)

beginning; they took the greatest interest in all our affairs. The penguins, particularly the small ones (*Pygoscelis Adeliæ*), seemed to us remarkably intelligent, and we took great interest in watching them. They had an almost human appearance when walking across the snow, and, indeed, they had many human attributes, especially in their social customs.

We often met companies of six or eight or more penguins promenading on the pack in the sunshine. When they saw us they generally exhibited curiosity, and approached to get a nearer view. I do not know if these birds have the instinct of the naturalist, and take a lively interest, doubtless purely philosophic from their point of view, in everything new which presents itself, or if the object of their investigations is entirely practical, but they certainly came near

us with a distinct purpose of making examination. But if we had the misfortune to excite much curiosity, they became aggressive. One would first come close to us and reconnoitre, and then, on his order, the others would advance with a menacing air, and the battle began—a battle in which we sometimes had trouble to demonstrate effectively our superior strength. On one occasion we were able to observe that the penguins are musical amateurs. Unfortunately, we could not ascertain if they are equally able to appreciate "talent and classical music," for we had no *virtuoso* amongst us, nor indeed any musician, although we all, without exception, played numerous melodies and even operatic airs on the ship's barrel organ. But in any case—and the thing is worth noting—one of the sailors delighted to exercise himself upon the trumpet, and the penguins came from great distances to listen to him—no doubt to learn something new.

Often, very often, these brave penguins amused us, and when we were tired of preserved foods, specially with the Australian rabbits, they afforded us real succour, after we learned that the flesh of penguin is excellent eating. It is to be imagined that our existence in the pack was not of the gayest, however. Far from being ideal, the life of the polar explorer is often sad and monotonous. In the region where we were storms are frequent, and failing storms, fogs and snow-drift often rendered excursions impossible, and sometimes we were unable to walk about even close to the ship. Then at times the ice would open up, and the floes press against each other and break into fragments. These squeezes were most uncomfortable to watch when in the immediate neighbourhood of the ship, and hearing the grinding of the ice, the groans of the ship, and the trembling of the rigging as she rose and fell again, we experienced sickly sensations which may be imagined—we realized the gulf which separated us from the abysses of the ocean, and we longed for the land.

The *Belgica* was only once seriously nipped during the autumn months; but she held out, and the ice, which broke under the pressure on the starboard bow, went under the hull. The pack took a long time to consolidate. Whenever the wind fell the floes united, and the snow-drift over the surface of the ice helped to transform it into an unbroken plain. But as soon as the wind sprang up, the ice gave way again. Thus it was only with the cold, as it became more and more intense, that the floes consolidated. The ruptures grew further and further apart, and our situation became gradually more secure. Ultimately the *Belgica* was fixed in the middle of a field of ice, to which she was attached as if built in it; this we called "our floe." After this it was only from afar that we heard the noise of the ice after the wind had ceased to howl in the rigging, and the ice was yielding to pressure. And often in the silence of the night, lying in my berth, I put my ear to the wall and listened to hear what was happening a long way off.

8. *Investigations.*—I observed the *aurora australis* for the first time on March 14, when I witnessed a remarkably fine display, which impressed me greatly. The play of light was extremely varied, exceptionally so in this particular case, and the phenomenon presented a most imposing spectacle. The horizon amongst the ice was entirely free; we had the whole vault of heaven before us. I will not again describe the scene, but will refer those who are interested to my preliminary notices, and to the special memoir on auroræ published in the reports of the *Belgica* Expedition.* As the last-named publication is still in the press, I may give some notes on our scientific work generally. As soon as we had definitely resolved to winter in the antarctic, we had to organize an observing station. This station was not fixed. Our floe turned so as to displace the bow of the ship, but only slightly, and ultimately the direction remained—in spite of the drift—almost constant. The icebergs visible on the horizon had a motion scarcely different from our own; we kept them in sight nearly the whole time. During the drift the floes usually moved *en bloc* over a wide space, but occasionally they changed their positions (after a strong drift), so that one occupied an entirely different place relatively to its neighbours. This was at least the case as shown by the icebergs, which were fixed in the floes in the same way as the *Belgica*.

Lecointe made frequent astronomical determinations of position, and deduced therefrom the direction of drift. For this purpose a wooden hut was erected on the port side of the ship, quite close to it, and electric communication was established so that Dobrowolski could note the chronometer on board, while Lecointe himself observed the stars in the artificial horizon. During his observations in "his observatory" Lecointe was certainly sheltered, but as he often remained there without moving, he generally returned on board with his fingers half frozen. We were always eager to hear the result of the calculations. On May 31 Lecointe announced lat. 71° 36′ S., the highest we attained during our drift. Sometimes we moved northward with southerly or south-westerly winds—this we heard with joy; but with change of wind we would again go towards the pole, or eastward or westward, and so we wandered from place to place, sometimes back in our old position, sometimes far to the westward. Apparently we remained immobile, for everything round us followed the same course; we always took our dreary scenery with us. The drift of the *Belgica* with the ice is the longest experienced by any vessel; the chart shows that the movement of the pack was guided by an obstacle to the east and south of us, and the existence of land in those directions is further indicated by our soundings. Depths diminished to the south and east, and my

* H. Arçtowski, "Aurores australes" ('Rapports scientifiques sur les résultats du voyage du S.Y. *Belgica*').

bathymetrical chart, published in the *Geographical Journal*, shows that during nearly all the time we were on a continental plateau. The pack in which we were may be regarded as a coastal pack, no doubt of great extent, but different in every respect (especially with regard to its movements) from the pack of northern polar regions. It is possible that in some years the pack becomes detached like that in the Ross sea, but the observations of Cook and Bellingshausen, as well as our own, in 1898 and 1899, indicate that this must be exceptional. I am of opinion that the great Graham Land peninsula forms an anticyclonic region, so that, far from driving the ice towards the ocean, the prevailing north-easterly winds of the summer months send it southward; but in the Ross and Weddell seas the same anticyclonic winds produce the opposite effect, because, as they come from south-east, they are diverted towards the north, Victoria Land being, in all likelihood, equally a region of high pressure. The forthcoming English expedition should decide this question.

On board the *Belgica* I took every opportunity of making soundings; the soundings were usually accompanied by observations of temperature, and the collection of samples of water for the estimation of density.

Racovitza made frequent use of the vertical net for the collection of plankton; and, thanks to the drift, he was also able to explore the bottom. He employed the trawl, with swabs, and was but little satisfied because these cumbrous appliances were brought up, after much labour, filled with pebbles which only went to enrich my geological collection, about which he cared little! The antarctic plateau is entirely covered with boulders, brought by the icebergs from distant land, and the sediments are for the most part terrigenous. But Racovitza's take did not consist exclusively of pebbles; he obtained good hauls of animals entirely new to science, and, as everything was carefully preserved, he has brought back a collection of great value. His treasures are now in the hands of competent specialists, and will furnish an important contribution to biogeography.

Our lamented Danco, who had constructed an observatory on the pack, did his best to obtain reliable observations of the magnetic elements, under the unfavourable conditions.

The hourly meteorological observations carried on by Dobrowolski and myself formed our principal occupation. When it snowed, the snow-crystals were examined and described; when there were clouds (particularly cirrus), Dobrowolski attempted to follow all their transformations, and especially to ascertain the direction of movement; and any optical phenomena were studied with the greatest care. Thus the days passed, not too quickly sometimes, in constant and assiduous labour.

9. *The Wintering.*—On May 17 we saw the sun for the last time. According to calculation, the centre of the sun was 40′ below the horizon

at noon on that date, and it was, therefore, because of refraction that we were able to observe half the disc, travelling along the horizon, for over an hour. For reasons which I am unable to explain, the appearance presented by the sun was very variable; at one moment it seemed flattened, almost square, at another notched and jagged. Such anomalies in the refraction of objects on the horizon are often observed in the polar regions.

From this day, we were not to see the sun again for two months. At the beginning we did not dread the prospect of this long polar night before us, but before the sun had been gone many days one of us became very ill. Danco lacked the constitution to hold out, and on June 5 he died. It is useless to dwell on sad recollections. He was loved on board the *Belgica*, and this loss, following on the death of the sailor Wiencke, who was washed overboard by a wave in Bransfield strait, made a deep impression on us. In the obscurity of the midday twilight we carried Danco's body to a hole which had been cut in the ice, and committed it to the deep. A bitter wind was blowing, as with bared heads, each of us silent and sad, we left him there . . . and the floe drifted on.

In the antarctic regions, thanks doubtless to the detestable climate, the disastrous effects of the polar night are far more marked than in the north. There is a general lowering of the system, and the heart acts feebly. Several of us developed serious symptoms, and without daily care on the part of the doctor, others would not have survived the period of darkness, though it was relatively short. One part of Cook's treatment was very effective and ingenious. Those who were most affected by deficient circulation were made to stand in a half-naked condition close to the red-hot stove, for several hours daily. In this way the action of the solar radiation was in part replaced by rays of artificial heat—in a manner admittedly primitive, but none the less beneficial.

Life on board during the polar night was of great interest from a psychological point of view. One finds one's self in conditions of existence altogether abnormal, and crowded against one's fellows in an uncomfortably narrow space. Some became nervous, excitable, and sleepless, with the imagination continually wandering and dreaming. I was one of these. Others, more happily constituted, became chronically tired and indifferent; these slept much. But everybody was content to spend twelve hours a day, or more, in bed. One of the crew developed maniacal tendencies; another, in more evil case, was brought home insane. Since the return of the expedition, one of our best men, Knutsen, has died, doubtless from heart disease contracted in the antarctic.

On board the *Belgica* we tried to amuse ourselves, during the dark days of winter, as best we could. We read much, but our library was

inadequate. Personally, I should greatly have liked an encyclopædia, and some Polish tales; a single volume of Sienkiewicz, which I happened to have with me, was read and re-read with great pleasure. We spent our evenings playing cards, and although I have always had a great aversion to cards, and indeed to games in general, I confess to pleasant hours spent at whist. We had to play for something, and as we had no money, we gave notes of hand (which we had not the remotest intention of honouring) for sums of 100 to 10,000 francs, and risked the most hazardous combinations. Sometimes the bank held

FIG. 9.—THE "BELGICA" DURING THE WINTER NIGHT.
(*Photo by moonlight, Cook.*)

100,000, or even a million; we amused ourselves like children in making and losing fortunes.

Personally, I retain many pleasant recollections of the polar night, for I made meteorological observations after all the others had gone to bed; and, in the profound silence that reigned on board, alone in my laboratory, I rejoiced in the solitude. Between the hourly observations I was able to read a great deal, and to profit by the perfect tranquillity, so difficult to obtain under ordinary conditions.

The sun reappeared on July 23. With its return our torpor disappeared, and gave place to general activity. Our usual work was resumed, and we were again able to venture on the ice. Lecointe, Cook, and Amundsen even risked a long expedition, taking with them provisions for fifteen days, a fur sleeping-bag for three, and a tent.

FIG. 10.—FORMATION OF "RASSOL FLOWERS" ON THE NEW ICE IN AN OPENING PRODUCED DURING THE DRIFT OF THE PACK.
(*Photo by Cook.*)

They stayed out for a week, but did not make much progress, for, after a strong breeze, several channels formed in the ice-field, and they had the greatest difficulty in regaining the ship in safety. We had no kayaks, and the practical result of this little expedition was to show that without them all attempts to traverse long distances on the pack must be futile. It was also made evident that it is impossible to go far from the floe on which an expedition is encamped without running grave risks of being unable to find a way back. For this reason I do not appreciate the opinion of a German critic, who has expressed surprise that we did not try to attain a high latitude on the pack, by following a direct route to the pole. The great problem is to find the position of the ship when it is time to return to it. If we had left the *Belgica* on August 10, in lat. 70° 50′ S., long. 86° 30′ W., we should have had to find her again, one month later, on September 10, in lat. 69° 50′ S., long. 82° 40′ W., and I greatly doubt if my German critic, even with the most favourable hypotheses, could have accomplished this *tour de force*.

With the return of the sun we made an effort to discontinue our *régime* of preserved food, and to live entirely on fresh "beef-steaks" of seal and penguin. It is extraordinary how the change pleased us. We ate nothing afterwards on the *Belgica* but the delicious "penguin beef-steak," which has not, it is true, much resemblance in flavour to the ordinary beef-steak, but is none the worse for that.

10. *The Icepack.*—The expeditions on the ice were not made exclusively

with the intention of filling our larder, for in most cases it was not necessary to go for hours along the edge of the waterways to get penguin and seals; as a rule, we got more than were needed. But the exercise did us a great deal of good, and we willingly undertook long excursions.

Whenever the weather was not foggy we could easily discern the aspects of the pack, and I gladly profited by some fine days to photograph the varied forms presented by the surface of the frozen sea. The rigid crust of the frozen ocean well deserves special study from a geographical standpoint. The numerous descriptions of the pack-ice of north polar regions, which have been left to us by the older voyagers, and especially those of Weyprecht, lead me to suppose that the antarctic ice differs from it in several respects. The characteristic feature of the southern pack is the thick layer of snow which lies on it all the year round. Except for the young ice, which forms in the open channels, is broken up by every movement caused by the wind, and often presents a bare glassy surface, the floes resemble an immense plain covered by a thick mantle of snow. The weight of this snow is so great that the ice is often depressed below the water-level, and the base of the snow is transformed into blue, granular, compact ice, very different in its physical properties (composition, structure, etc.) from the ordinary ice produced by the freezing of sea-water. The fallen snow is changed into *névé* under the influence of solar radiation and frequent changes of air temperature. Under the action of wind, freshly fallen snow is drifted

FIG. 11.—INFLECTIONS OF THE ICE PRODUCED BY PRESSURE; FORMATION OF ICE-HUMMOCKS.

(*Photo by Arçtowski.*)

FIG. 12.—AN OLD PRESSURE-RIDGE IN THE PACK.
(*Photo by Cook.*)

over the ice-field like sand across a desert, and whenever an obstacle like a hummock is met with, small dunes, or ripple-marks, or long trails, clearly indicate the direction of the wind. The kumatology of snow was specially interesting in the region of "pressure hillocks," and I have taken many photographs illustrating the description which I shall give of these varied phenomena in a special memoir of the *Belgica* reports. I have spoken of regions of "pressure hillocks." I may explain that after the polar night and later, during the summer, the rigid surface of the Antarctic ocean became markedly different in appearance from when we first entered it. The small floes joined together, so that the independent units became larger and larger, till they were sometimes several miles in diameter. From the crow's nest of the *Belgica* we could see the whole of our floe, and the neighbouring floes pressing hard on it and on each other, all of them fringed with hummocks. These little elevations were regions of true folding and faulting, and of great interest on closer study. Miniature mountain chains, they had all the characters of the great ranges of the earth, for all the traits of a mountain range were present, except those due to running water and volcanic action; a "structural surface" altered only by a leveling agent *par excellence*, drifted snow. I will not commit myself to a maze of description; I only wish to point out one analogy. The distribution of gravity on the surface of the continents presents many strange anomalies. Amongst these, modern research seems to have disentangled one general principle—that the value of

gravity (reduced to sea-level) is less in a mountainous region than in contiguous plains. It seems as if there were empty spaces under the mountains, as if where the crust is crushed and squeezed so as to form ridges on the surface, the denser magma is found at a greater depth than elsewhere. This principle goes by the name of *Isostasy*. The isostasy of fold-ranges compels us to admit that the masses of the crust which have been compressed along a line, forming a chain of mountains on the surface, are equally depressed into the dense magma of the interior, so that a corresponding chain, composed of relatively light material, faces towards the Earth's centre. It seemed interesting to test this hypothesis for the miniature ice-ranges which were formed along a line perpendicular to the direction of pressure, and to ascertain the conditions of equilibrium of the hummocks. I therefore measured the thickness of the ice in different places, and made a series of borings (with a small geological boring tool) along a line perpendicular to the alignment of one of the hummocks. The result is important, for I found under the hummock a symmetrical protuberance much larger than that emerging above the surface of the sea. The hummock was therefore in perfect equilibrium, the ice accumulated below displacing a volume of water sufficient to keep the little range perfectly stable, and therefore to make it permanent. The greatest thickness I measured in this particular case was 9 metres (29·5 feet); but as this was in a hummock which raised itself scarcely 2 metres ($6\frac{1}{2}$ feet) above the sea surface, I am led to suppose that in the regions where the ice is greatly crushed and dislocated the maximum thickness may be 15 metres (49·2 feet), or even more. Such, however, must be regarded as exceptional cases, due to pressure. In normal circumstances the field-ice may be taken as about

FIG. 13.—ASPECT OF NEW HUMMOCK PRODUCED BY THE COMPRESSION OF TWO FLOES.
(*Photo by Arctowski.*)

2 metres ($6\frac{1}{2}$ feet), or, in the case of ice several years old, not more than 3 to 4 metres (10 to 13 feet) in thickness. The freezing action clearly tends to a limit which cannot be surpassed, however low the temperature. This is the invariable result of measurements in the arctic regions, and it is entirely supported by our measurements during our wintering in the antarctic.

11. *Summer in the Ice.*—The greatest cold we experienced occurred in September; on the 8th the thermometer sank to $-43°$ C. ($-45·4°$ Fahr.), an extreme temperature when one considers that we were very far from land, and only in 71° S. lat. We took advantage of the sunshine when it came, following the example of the seals, who lay motion-

FIG. 14.—DRIFTED SNOW BURYING OLD HUMMOCKS.
(*Photo by Arctowski.*)

less on the ice for hours together enjoying sun-baths. When there was no wind we felt warm at a temperature of $-15°$ C. (5° Fahr.), and even $-25°$ C. ($-13°$ Fahr.), which is easy to understand, as evidently the temperature of the air did not indicate all the heat we felt, and we had only to go into the shadow to feel the difference.

In the antarctic there are strong equinoctial storms, which follow close upon one another. The storms which preceded the establishment of the summer *régime* were accompanied by tremendous snow-drifts, and as the *Belgica* presented an obstacle to these, large quantities of snow accumulated, and at length almost buried her. It became necessary to extricate her, and the work had to be done quickly, as she threatened to sink gradually, dragged down by the enclosing ice. But we succeeded in clearing all the snow and ice down to sea-level, and the ship raised herself out of the ice in which she had been nipped. Future expeditions may profit by our experience; at the beginning

of favourable weather the ice should be entirely cleared away from the ship, so as to leave her free to move if the pack opens.

12. *Leaving the Pack.*—Until December we had every confidence that the sun would melt the ice and break up the floes to such an extent that we could make our escape easily. But when December had passed, and the sun made his daily tour of the horizon without melting anything, we felt ourselves deceived. The lanes certainly opened more freely, and although the thermometer fell to $-14°$ C. (6·8° Fahr.), the young ice ceased to form. Everything seemed to promise that the *Belgica* would soon be in an open channel, and making her way gradually to the edge of the pack. But our big floe would not give way; there we remained, at the mercy of fate, helpless in the middle of an ice-field several miles in circumference. We had to keep up our courage, although our provisions were coming to an end, and rather than face a second winter we should have to leave the ship. We would not have died of hunger, for penguins were plentiful, but we should have had to prepare seal-oil for lighting purposes, and as our coal would have run short, we would have had to depend on seal-fat for heating. In effect, we should have had to lead the life of Eskimo, and after the experience of one winter in the ice, we had enough of it. So we resolved to attack our floe with the explosives with which the expedition was provided. We carried a large supply of tonite, but experiments at low temperatures had previously shown us that the effect of this explosive on the ice was practically *nil*. Bombs laid on the surface produced no effect at all. We obtained better results afterwards with mines, laid in the ice, and these led us to make experiments on a larger scale. A hole was bored through the ice about 500 metres (1640 feet) ahead of the *Belgica*, and in this we placed a barrel of dynamite, about 3 metres (9·8 feet) below the surface. Several long fuses were lighted, and while they burned we removed ourselves as far away as possible, believing that the explosion was about to blow a good part of our floe into fragments. Nothing of the sort happened. The spectacle was imposing: a terrific report was heard, a sheaf of pulverized ice and water rose to a height of 50 metres (160 feet), but there was no fracture, not even a crack in the ice. We had to give up all idea of explosives.

After doing some work in a direction leading the shortest way out of the pack, we perceived that this route was hopeless, for we should have had to cut through three lines of hummocks, where the ice was very thick. But a closer examination of our floe fortunately revealed an old fracture, close astern of the ship, on which the ice was only from $1\frac{1}{2}$ to 2 metres (4·9 to 6·6 feet) in thickness. Along this we cut a channel 700 metres (2297 feet) long, and wide enough to allow the passage of the ship. The task was long and arduous, but as it was a matter of life or death to us, and as it was equally urgent that the results of our scientific work should not be lost, it was no use hesitating, and the work went on cheerily, day and night, for a whole month. As we

had only three saws, we could not all work together, so we divided into two parties, one working by day, the other by night. We had no want of light, for the work was done during January and February.

The method ultimately employed was very simple. Starting from the edge of our floe (AC, Fig. 15), two lines AB and CD were cut; then EF, and the triangle AEF was detached and pushed out of the way. Next the line GH was cut, and the quadrilateral ECHG removed; then EK, and another polygon was free. Thus we got rid of the ice piece by piece, and as each slab had to be pushed out, the channel already cut was kept open.

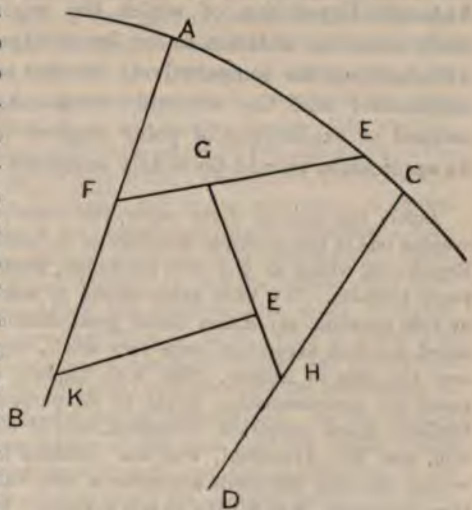

FIG. 15.

The work was almost completed when a storm came upon us. Strong pressure was brought to bear on the pack, and the unfinished part of our canal gave way. Then the *Belgica* was nipped between two large floes, and as the swell from the ocean reached us from outside, these crushed and left the vessel alternately with every wave. We had three days of anguish, three days in which we could not tell what a moment would bring forth, for the shocks followed one another without ceasing, and the *Belgica* might yield to the pressure at any moment. But it turned out otherwise. The sea went down, and after some more labour, aided by a free use of our tonite, the *Belgica* was finally delivered on February 14, 1899.

We made rapid progress through the ice, northwards this time, for a whole day; but then, on the edge of the pack, our way was completely barred by a number of small floes, packed close together. We were drifting rapidly to the west, and ahead of us innumerable icebergs were passing; it seemed as if the pack were surrounded by a belt of bergs, through which we must pass. It was only after a long month's waiting, tossed about all the time by the ocean swell, that we got a chance to escape to the open sea, towards which the water-sky to the northward had all the time been showing us the way.

The *Belgica* left the pack on March 14, and on the 28th we were back in Punta Arenas.

Conclusion.—I do not think this short account of our adventures should discourage future voyagers in the antarctic pack-ice, but rather the contrary. The *Belgica* Expedition has shown that a small vessel, provided with only a small auxiliary engine, can enter and remain

in the pack with every confidence; and further, that one can get out again and return home safe and sound. But the important fact established by this first wintering in the antarctic is that the new method of exploration, first tried by Nansen in the *Fram*, can afford excellent scientific results. The value of the results of the *Fram* Expedition has been indicated by the two volumes of the report already published, and I can affirm that the scientific results of the Belgian Antarctic Expedition, of which the report is in the press, will form a really valuable addition to our knowledge of the antarctic regions, notwithstanding the comparatively limited resources at the disposal of the commander and the scientific staff. Again, I repeat that the new method of exploration of polar regions is extremely fruitful, and that its application should be widely extended.

Before the reading of the paper, the PRESIDENT said: We welcome here this evening one of the principal members of the scientific staff of the Belgian Antarctic Expedition, which, as you will remember, wintered in the antarctic pack in the years 1898–99. We have every reason to admire the work that has been done by this scientific expedition under great difficulties. The funds which were collected for that expedition were very small, very small indeed. I remember going over the ship in August, 1896, with Captain Gerlache, and thinking how very small the accommodation would be for purposes of a polar voyage; but M. de Gerlache found numerous volunteers, men of distinction in science, to accompany him, and Mr. Arçtowski, who was constant in his observations throughout the winter, and who also made a number of very valuable observations on the land that they discovered, is now with us this evening. I am sure we shall all be extremely interested in what he has to tell us, and in the views which he will be able to give us on the screen, and we shall give him a very warm welcome at the end of his address. I now call upon Mr. Arçtowski to read his paper.

After the reading of the paper the following discussion took place:—

Dr. W. T. BLANFORD: I am sure that everybody will have listened with very great interest to the accounts Mr. Arçtowski has given us of the antarctic regions. But whilst we have listened with very great pleasure to his description of adventures, the points in his accounts which will, I think, attract most attention relate to scientific observations. The additions to geographical knowledge appear at first not to be very great: an additional sound has been found, a number of small islands have been mapped and named, and there it may at first seem that the geographical part of the discovery terminates. I can only say that I think more important geographical observations have been made than those which are connected with the additions to our maps, valuable as these are, and although the subjects were necessarily, in the abridged account to which we have just listened, passed over very lightly, there are two points to which I should like to call attention. In the first place, Mr. Arçtowski has made some most valuable observations on the older glacial action in the southern hemisphere, and the most important of these are perhaps in Terra del Fuego, where Mr. Arçtowski has shown very clearly that the glacial conditions at no very distant geological date were greater than they are now. He has found moraines and other evidences of glaciers where no glaciers now exist; he has shown that exactly the same phenomena occur near Cape Horn which are so striking in parts of Europe. Now, I cannot say that no observations of ancient glacial evidence have been made in South America before, because I have heard some; but they were rather opposed to Mr. Whymper's very important observation

in tropical South America. I ought to have premised by saying that Mr. Arçtowski has not only shown in the case of Terra del Fuego that the glacial conditions were much greater at no distant period than they are now, but he has also shown the same in Graham Land. I am quite aware that the occurrence of a glacial period in Pleistocene times is disputed by a few—by Sir Henry Howorth, for instance—but I think the general opinion is that at no distant period the temperature was lower than it is at the present day, and that there existed great glaciers where there are none now. At first the difference was attributed to purely local conditions; it was supposed to be the result either of greater elevation or of a different distribution of land and water, and it was shown how if the land in North-Western Europe and in Canada were a little higher, and if the Gulf Stream, instead of flowing into the Atlantic, flowed somewhere else, a glacial epoch might be brought back to these islands, and that we might be enjoying masses of ice in very much the same form as they exist in Greenland. Then there was another theory—this was Dr. Croll's—which was that although glacial conditions prevailed over the whole of the northern hemisphere, or over a great part of the northern hemisphere, they coincided with a time of comparative warmth in the south, and it has even been suggested by some that the southern hemisphere is at present enjoying a glacial epoch from which we are free. The idea of local glaciers, although it is still strongly maintained, has received one or two very hard blows. In the first place, there were those wonderful discoveries in Central Africa that glaciers came down on Mount Kenya at no distant period much lower than they do now. That is one of the most important observations made. Long before that Sir J. Hooker had shown that glaciers in Sikkim that now come down to 15,000 feet above the sea came down to 7000 feet. Similar observations have been made in New Zealand. So far, then, as the evidence extends, there is much in favour of the view that the glacial epoch was universal, and the evidence does not show that the cold period alternated in the two hemispheres. Although it is not quite certain, I am strongly inclined to believe that the glacial epoch was a period of intense cold throughout the entire world.

Then there is another point on which Mr. Arçtowski throws considerable light; at least his remarks are eminently suggestive. I do not quite understand whether Mr. Arçtowski holds that the area round the Belgica strait is a sunken area; but I think I understand him to regard it as an area of depression.

Mr. Arçtowski: Yes, geologically speaking.

Mr. Blanford: Certainly the whole of the features of the land are in favour of depression having taken place. It is extraordinary the way in which the extreme southern portion of South America ends off in deep channels between islands, and in scattered islands that stand away from the coast. I do not think there can be any reasonable doubt that depression must have taken place in the area round Cape Horn, and there is a very similar conformation in the northern portion of Graham Land. Now, Mr. Arçtowski speculated on the question as to whether the Andes, after running through the whole of South America, are not continued in Graham Land. That is an important geographical suggestion; but that the area round the antarctic region is an area of depression is very strongly indicated by evidence tending to show the connection in former times between the antarctic area and the other lands in the southern hemisphere. I spoke of this some time ago when dealing with some of Mr. Bernacchi's observations, and I pointed out that there were some curious connections between the fauna of Australia and the fauna of America. Although I am afraid it is too late to enter upon what is a very curious point, I will simply say this, that there is an indication that in Upper Palæozoic times, when the coal flora extended over the northern hemisphere, a totally distinct flora flourished in the southern hemisphere. Now, the remarkable

point about that southern or *Glossopteris* flora is that it appeared in Australia, in India, in South Africa, and in South America. Of course, the connection between Australia and South Africa might have been by way of India; but it is impossible to account in that way for the presence of similar plants in South America. And another point is, that in all these countries this southern flora is preceded by evidence of a glacial epoch. Then this flora gradually came northward, and it appeared in Russia, and in Mesozoic times it appears to have covered the whole world. But taking all the evidence together, and the remarkable fact of the *Glossopteris* beds being underlain by strata containing boulders which indicate glacial conditions, it does appear a reasonable conclusion that this flora may have come from somewhere in the neighbourhood of the south pole, and its appearance simultaneously in the southern continents shows that they were all in connection with each other and with the antarctic area, which was probably a continent then. I merely take the two cases to which I have referred as showing the great amount of interest that attaches to the observations made by Mr. Arçtowski.

Mr. George Murray: I extend the very heartiest congratulations to Mr. Arçtowski for the very admirable scientific results that were brought back from his expedition. They were in inverse proportion to the equipment which he has described as being of the most modest character. I wonder more and more, as further facts, and deeper and more important facts, come out as to the performances of the *Belgica*, how they were ever accomplished. It can only have been by the most strenuous labour both by the officers of the ship and the scientific staff on board, and I think we cannot use words of too high a character in praise of their exertion. He laments at the beginning of the paper that he was unprovided with written instructions for the expedition. I know it is a subject which is a difficult one, but I have often thought that expeditions might be conducted quite safely, and even with a large degree of success, without instructions. A gentleman whose name has been bracketed with that of Sir Clements Markham gave me this advice not long ago: that it was a very excellent thing to be provided with instructions, and still more excellent if they were to be thrown over the side. I will leave that part of the subject alone, and go on to one of the points that have been raised. Mr. Arçtowski's paper raised in my head the idea that there might be rehabilitated that view of the late Dr. Croll which fascinated us a quarter of a century ago. I am afraid Dr. Blanford has given it a death-blow, and we cannot fall back upon that easy explanation of glacial phenomena; but with regard to the second part of his remarks I really feel I must venture to differ from the conclusions he drew. I think that his conclusions drawn from the *Glossopteris* flora are perhaps rather large compared with the facts upon which they are based. I cannot venture to put this view forth as a geologist so much as a botanist. Knowing something of the flora of that particular stage of development of the vegetable kingdom throughout the whole world, I think we must be extremely cautious indeed of drawing special inferences from special occurrences in special places. I think, if this were done, I could bring forward a series of facts to justify another series of conclusions. I have no facts to place directly against Dr. Blanford's, but I have other facts pointing in another direction that wholly conflict with his arguments. I come to a subject—and I feel I am only plunging from one subject to another—to a question which exercises the mind of the President of the Society at this time more than any other, and that is the provision of a relief ship to the Antarctic Expedition. I believe it is the duty of this relief ship that it should go to the antarctic regions and discharge its primary duty to Captain Scott and his gallant crew, but that it should escape at once out of the ice, should circumnavigate the globe between 55° and 60°, and take a line of soundings round the world. I believe by doing that it would carry out a

great feat of scientific exploration, a greater feat than any direct assault upon the antarctic continent. I believe it would suggest more; it would give us a line from which to advance, and from which to interpret those advances which have been made in the past from the time of Biscoe to the time of Ross and others later, and I think that is the great service which I should strongly advise and recommend. There is one other little point. Reference was made by Mr. Arçtowski to the services of Bellingshausen. I wish those services, his adventures, could be laid open; they have been hidden up in the Russian language. By the instrumentality of the President, and by his extraordinary knowledge of these early voyages, in the forthcoming manual we shall have placed before the world the adventures of the early navigators, which are almost entirely unknown to the people of this country. My attention was called by Sir Clements Markham to the adventures of Biscoe, which have been extracted and will appear in the Manual, and I will promise you this, that for a story of gallant adventure I do not think you will find in English literature its equal. He made two voyages; he underwent the most appalling hardships; he carried out most excellent explorations recorded upon our maps; and as I told you, it was so little known to us, that when I sent the proofs of this part of the voyage to Sir Joseph Hooker, whose knowledge of antarctic literature is almost unrivalled, he said the greatest part was new to him, the adventures were excellent and the scientific part was excellent, and altogether it was a most gallant performance. I am very glad that this Society should be not only the inaugurator of a new voyage, but that this should be the occasion of a rescue from the past of a story of one of the earliest British navigators in the antarctic seas, with his almost unparalleled success and experience in the antarctic regions.

Dr. Mill: I feel it is too late to offer any remarks on this interesting paper. One could say much, but I will say little, and only again congratulate Mr. Arçtowski on the splendid scientific enthusiasm he has shown. For those labours were carried out without pay, without, I am afraid, very much encouragement at the time, and in the face of difficulties which he has only faintly indicated; and they were in many departments—not only in geology, but in meteorology, he has produced results of the greatest importance. He has added his name to those of his distinguished countrymen who figure so splendidly on the roll of scientific explorers in the southern hemisphere—I refer to the Polish travellers in Australia. I congratulate Mr. Arçtowski with great heartiness both on the quality of the work he has done, and on the admirable way in which, in English learnt within the antarctic circle, he has given us his paper.

The President: It is almost too late to continue this discussion, unless any one wishes to ask Mr. Arçtowski any question.

Admiral Markham: Mr. Arçtowski has given so fully all the details of the expedition, and has given us such a graphic account of the way in which the members of it lived, that there is very little to ask; but I would like to know, with regard to the drift of the ice, whether it was occasioned by the prevalent winds, or whether it drifted backwards and forwards irrespective of the force of the wind; and also with regard to the thickness of the ice in which the *Belgica* wintered. The lecturer stated, I think, that the ice met with during the cruise was from $2\frac{1}{2}$ metres to 3 metres (8·2 to 9·8 feet) in thickness; I should like to know if that was the general thickness of the ice in which the *Belgica* wintered during her drift in the pack.

Mr. Arçtowski: In answer to that question, I must say we have not data enough to give the mean thickness of the ice. The mean thickness of our floe was about $2\frac{1}{2}$ metres (8·2 feet); but in some places we measured ice of 9 metres (29·5 feet) in thickness. I think that in one year the thickness of the ice may increase to 2 metres (6·6 feet). With regard to the drift, I can only say that in our region,

where the *Belgica* wintered, the drift is an absolute function of the wind. Of course there are deviations in the course, deviations which are due to the lands situated certainly in the east, very probably in the south, but almost always when the wind came from the east we drifted to the west or south-west along the unknown shores. I should like to refer to Dr. Blanford's remarks *apropos* of the universality of the glacial epoch. I have already published a paper about the question of the climate of the glacial epoch, published in the review *Ciel et Terre* (March, 1901), and I had occasion to discuss the question with Prof. Penck, of Vienna, on the last meeting of the German *Naturforscherversammlung*. It is very probable, if not certain, that the glacial epoch in the southern hemisphere was contemporary with the last glacial epoch of the northern hemisphere. What belongs to the climate of the glacial epoch, the idea of a very moist climate, which was expressed by Lyell and many old geologists, must be put away, and we must take as the most probable, as the more universal, a cold climate. Some comparisons have obliged me to think that the mean temperature of the antarctic land and of the Terra del Fuego was from 8° to 10° Centigrade (14° to 18° Fahr.) lower, during the glacial epoch, than it is now.

The PRESIDENT: I am glad to be able to congratulate the Society on the publication of what Mr. George Murray has referred to—two of our most interesting manuscripts of the antarctic voyagers, Biscoe and Balleny. They were presented to us by Mr. Charles Enderby, the great promoter of antarctic voyages, and have remained in manuscript in our library for half a century. They certainly will be found by the Fellows of this Society, when the Antarctic Manual appears, to be very well worth reading, and to be extremely interesting as well as suggestive. I have heard also that Bellingshausen the Russian explorer's work which has remained in Russian, but which of course Mr. Arçtowski is intimately acquainted with from his knowledge of the Russian language, will appear in German, I believe by next August, in which case the expedition will be able to receive a copy before it finally leaves for the south. We shall all have very great cause to thank Mr. George Murray for the most valuable volume which is about to appear. It now only remains to us to pass a very hearty vote of thanks to Mr. Arçtowski for his most interesting paper, and also for the beautiful illustrations—especially that half-dozen or more phases of the floe-ice, which are extremely valuable as well as interesting. They show not only the similarities, but also the great differences between arctic and antarctic ice, principally, I suppose, caused by the fact that whereas in the arctic regions the floe is covered by large ponds of water 2 and 3 and sometimes 4 feet deep in the summer, this never happens in the antarctic regions, where there is no thaw. Consequently the snow appears to accumulate during the summer, and presses the ice downwards in a way which does not happen in the arctic regions. Probably, as it reaches the salt water, the snow becomes converted into blue ice, and so the thickness increases. At the same time, it does not appear that throughout the winter the ice from its first commencement as young ice is of greater thickness than in the arctic regions—from 7 to 8 feet. All these photographs are exceedingly valuable, and so are those of the glaciers and of the icebergs. I trust hereafter we may have a volume from Mr. Arçtowski giving a complete journal of his work during the winter, and it will then be seen, as it will be also in the publication of his scientific work, what an enormous amount of industry and of strenuous exertion throughout the winter must have been devoted to these observations. I have already had the good fortune of seeing one of his volumes—that in which there is a record of every aurora that appeared throughout the winter, prepared with extreme care. Therefore science has much to thank Mr. Arçtowski for. We have this evening to thank him for the most interesting time we have passed in looking at his illustrations and listening to his most instructive paper, and I am sure you will all wish unanimously to pass a vote of thanks to Mr. Arçtowski.

WITH THE "DISCOVERY" TO MADEIRA.

By HUGH ROBERT MILL, D.Sc., LL.D.

THE voyage of the antarctic ship *Discovery* to Madeira was an extremely pleasant and propitious commencement of what we trust will be a prosperous and successful expedition.

She left Cowes at noon on Tuesday, August 6, and threading her way through the multitude of yachts at anchor in the roads, all flags flying at half-mast for the death of the Empress Frederick, she proceeded slowly down the Solent. At 3 p.m. the ship stopped opposite Little Yarmouth; the friends who had remained as long as possible were taken off by steam-launches, and, the partings over, the *Discovery* entered the Channel in the teeth of half a gale of wind. As she kept close along the shore, the last views of England were singularly attractive in the afternoon sunshine. The great model of the terrestrial globe carved in stone on the slope above Swanage showed up clearly as we passed, and final friendly wishes for a pleasant voyage were signalled from the Station on St. Alban's Head. Portland Bill was passed as it was growing dark, the light on Start Point was sighted at midnight, and in the morning there was an unbroken sea horizon. The contrary wind died away, and the pitching gave place to rolling; but though a swell was running into the Bay of Biscay, the motion of the *Discovery* proved to be remarkably easy, and no one suffered appreciably from sea-sickness.

Beyond meeting a boat fishing for bonito in the middle of the bay, passing a few vessels, disturbing some shoals of porpoises, and seeing many specimens of the stormy petrel, there were no external incidents to distract attention from the work on board. The sea changed gradually from the green of the Channel to the almost pure blue of the open ocean, the temperature of the surface water increased slightly, and the wind, swinging round into the north-east, made it possible to set full sail, and so ease the engines. What appeared to be the true trade wind was met off the Strait of Gibraltar, and freshened daily.

An immense amount of work in the way of settling down was got through in the first week. The executive officers had their hands full in overhauling and restowing the light gear carried on the boat deck, checking the lists of stores in the various holds, and arranging the duties of all members of the ship's company in case of fire or of suddenly leaving the ship. The scientific staff were no less busy in getting the laboratories into working order. Every particle of iron was hunted out in the non-magnetic area within 30 feet of that inmost shrine of science, the swinging table on which the magnetic instruments are to be placed. So keen was the hue and cry in pursuit of the forbidden metal, that one could almost excuse the visitors who a few days before

had inquired whether, to ensure a free field for magnetic research, the engines also had not been made of copper.

The microscopes were securely fixed to the tables in the botanical and zoological laboratories—one specially set apart for Captain Scott, whose interest in every branch of science pursued on board is of the most practical and personal kind. Tow-nets were arranged, through which sea-water is pumped continuously, and the collections of plankton, or small organisms drifting in the water, removed and examined microscopically at intervals.

In the physical laboratory, which lies outside the forbidden areas, the services of the carpenter had to be requisitioned to find secure lodgment for all the apparatus containing iron ejected from the biological laboratories. Fittings also had to be constructed for the various pieces of apparatus which are to be in daily use; standard solutions had to be made up from the chemicals which had been weighed out carefully on shore and brought on board in hermetically sealed tubes, the distilled water being supplied from the condensing plant in the engine-room. Lieut. E. H. Shackleton, having undertaken the determinations of density and chlorine in the sea-water, took a course of instruction in handling the various instruments and calculating the results, detailed tables having to be drawn up to facilitate the process. Mr. Ferrer got the apparatus designed by Prof. Letts for determining the amount of carbonic acid in the air into working order, and a definite routine for carrying on the chemical and physical work was established.

Lieut. Royds, who is in charge of the meteorological observations, found the best part of the ship in which to set up Dr. Black's marine rain-gauge and evaporimeter; and he also set the various recording instruments to work so as to compare their records. The difficulty of altering the clockwork of half a dozen delicate registering instruments daily in order to bring them to ship's time was so serious that it was arranged to keep them running to Greenwich time, but to make a mark on the time-scale daily at local noon so that the local time-scale also could be easily applied. The recording instruments worked excellently on board, and it was interesting to see how the irregular rise and fall of the barometer through a wide range characteristic of the British climate gave place to the regular diurnal wave of regular rise and fall as the ship came within the influence of the trade winds.

Experiments were made in flying the Hargrave box kites, which it is hoped will prove serviceable for obtaining meteorological readings from the upper air in the antarctic regions. The kites were found to rise easily and keep their position steadily, with very little strain on the line when the ship was under way. The instruments, however, were not attached in the preliminary experiments, and the difficulty of hauling in the kites without allowing them to touch the sea suggests the

necessity for enclosing the meteorograph in a water-tight case when used from the ship.

On August 14 the ship was stopped for sounding off Porto Santo, and a number of the deep-sea instruments were tested in 450 fathoms of water. No scientific observations were made, the trials being devoted to the necessary preliminaries, such as arranging the working of the various lines by the forward and after winches respectively. Soundings are made from the port and starboard bows, where small projecting platforms are provided for the sounding-machines. The result of the trials, which lasted for several hours, was to suggest various improvements in the arrangements.

At 2 a.m. on Thursday, August 15, the *Discovery* anchored off Funchal, in Madeira, and several of the officers and staff had their first experience of sledge-travelling in the smoothly gliding ox-carros or the somewhat alarming toboggan sledges which descend the steeper streets, propelled by the force of gravity at the rate of 20 miles an hour or even faster. The stay at the beautiful island was brief, and at 2 p.m. on Friday, August 16, the anchor was up, and, the fires not being lighted, the *Discovery* was towed out to sea by a little tug. Some miles off the shore waves were running high and foam-crested under the steady trade wind, but the sea-breeze set up by the steep sun-baked mountains caused an indraught that completely checked and turned the wind onshore all along the land. At 6.30 p.m., half an hour before sunset, the ship was cast off, 4 miles from shore, and commenced the voyage southward under sail "in the heel of the north-east trade." The last letters were passed on board the tug, and with three hearty cheers the ship's company took their farewell of the land for many a long day. The *Discovery* started under very moderate sail, but was making good way through the water, and from the report of the mail steamer from the Cape, which came in three days later, she must have met a gale on the second day out, which, being from a favourable quarter, should have enabled her to show her best pace under canvas.

The life on board the *Discovery* is particularly happy and harmonious. Captain Scott seems to have arrived at a happy compromise between the rigidity of naval discipline and the free-and-easy life of the yachtsman. Order and comfort rule in the wardroom and on the lower deck, every man intent on doing his own duty, but not hindering or ignoring the work of his neighbour. An arrangement was made by which each member of the wardroom mess presides at table for a week at a time, the order of succession being alphabetical. Each night after dinner the toast of "The King" is proposed in naval fashion, followed on Saturdays by "Absent Friends." Each morning at ten o'clock all hands are mustered for prayers, but there are no vexatious formalities in the working of the ship, the scientific aim of the expedition being kept in

view all through. The tinned provisions, so far as they had been tested proved of admirable quality.

As regards speed, the average of the whole trip to Madeira, for most part under sail and steam, came out at $6\frac{3}{4}$ knots an hour, but favourable opportunity occurred of seeing what she could do under only. Letters to the *Discovery* at Melbourne should be posted in Lon on Friday, October 4, and to Lyttleton, N.Z., on Friday, Novembe although it is possible that the mail of the following week in each may be in time.

SIR WILLIAM GARSTIN'S REPORT AS TO IRRIGATION PROJECTS ON THE UPPER NILE.*

By E. G. RAVENSTEIN.

It is hoped that the Asuan and Asiut dams will be in wor order before the flood of 1902, but even then there will be a deficie of at most 4000 million cubic meters if the utmost requirements of whole of Egypt in summer are to be satisfied. If the requirement Egypt alone were to be considered, it would not be necessary to g the upper Nile, for a dam (similar to that under construction at As could be built somewhere in the second or third cataract, and w store sufficient water for the purpose. But any project of the k entertained must take account of the requirements of the Sudan, wh large areas are solely dependent upon the annual rainfall for the supp of the population.

It was with a view to studying this question that Sir Willi Garstin, the eminent hydraulic engineer, and Under-Secretary of St for Public Works, paid three visits to the upper Nile, in 1899, 1900, a 1901, penetrating on the last occasion as far as Gondokoro. The in mation gathered during these journeys is embodied in a report wh Sir William presented to the Egyptian Government in June last.

In March, 1899, the White Nile above the Abbe island (235 k meters above Khartum) was bounded on both banks by belts of papy and ambach. The country in places was flooded for a distance of 2 o kilometers, and the khors draining the plains were full of water a green reeds. Landing was quite impossible. But in 1900, and ag in 1901, owing to the failure of the rains in the upper Nile regi during the preceding autumn, the general level of the river was fr 1·5 to 2 meters lower than during the corresponding months of preceding years, and large tracts of mud flats along the river-ba had been put under cultivation. The low water interfered with navigation of the river, and these difficulties were aggravated by float

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* 'Egypt,' No. 2 (1901). Map, p. 464.

masses of papyrus and reeds released from the blocks of *sadd* (or *sudd*) in the Bahr el Gebel.

The Sobat was explored only for a distance of 50 kilometers. The river for this distance has a channel about 100 meters wide, between high banks, a great depth of water, and a rapid slope, and as a feeder of the Nile it ranks next to the Atbara and the Bahr el Azrak. From December to March its waters shrink to comparative insignificance, but in July and August they are in full flood, and discharge probably no less than 1650 cubic meters in the second. On April 5 the discharge of the Nile 4 kilometers above its junction with the Sobat was 294·221 cubic meters per second; April 6, 24 kilometers below that junction, was 381,020 cubic meters; consequently the increased discharge due to the Sobat seems to have been 86·779 cubic meters.

The Bahr el Zaraf leaves the Nile above the Ghaba Shambe, and rejoins it, after an estimated course of 898 kilometers, in 9° 23′ 17″, about 80 kilometers below the Mokren el Bahur.*

In 1899 the volume of this river was very considerable, and when in flood it must have stood quite 1 meter above its usual level. In the spring of 1900, and again in 1901, the discharge of the river had become almost insignificant. On March 25, 1900 (128 kilometers above the junction), the discharge was only 32·16 cubic meters per second; and on April 3, 1901 (19 kilometers above the junction), it was 33·149 cubic meters. Sir William thinks that this decrease of volume is due to the removal of the sadd blocks, which enabled the waters of the upper Bahr el Gebel to escape freely, instead of being forced to seek an outlet through the "loop" of the Bahr el Zaraf.

The Bahr el Ghazal and the rivers forming part of its system are described as sluggish streams, the discharge of which, even when in flood, is insignificant (April 3, 1901, 36 kilometers above the Mokren, only 26·739 cubic meters). Hence that system does not play a prominent part in the actual Nile flood. It acts, however, as a large reservoir, which slowly drains away as the level of Lake No falls, and is therefore a potent factor in keeping up the level of the Nile in the summer months.

The lower Bahr el Gebel is bounded by reed swamps of papyrus, Um suf (*Phragmites communis*) and tiger-grass, broken at intervals by shallow lagoons or "mayas." There are no solid banks, properly so-called, and a rise of half a meter (in 1901) would have flooded the country to an immense distance. Signs of human life are rare throughout this region, the air is hot, and steamy, and malarial. The water, however, teems with fish, but whilst crocodiles are to be seen constantly, the

* That is, the "Meeting of the Waters." Sir William suggests that the "Lake No" of many maps ought to be called Lake Nuer. The name seems to be quite unknown in the country. Lejean gives the name of Bahr el Ajob to the sheet of water at the mouth of the Bahr el Ghazal, which is commonly known as Lake No.

hippopotamus seems to shun the river. A few night herons are the only representatives of bird-life as high up as the Elyab Dok. Beyond that old station the general character of the landscape changes; and higher land and forest approach on the west. "Sadd," properly so-called, disappears, and the river has never been known to be "blocked" to the south of the Ghaba Shambe. The marshes to the south of Bor are formed of a deep layer of sand, covered with a thin surface of clay, and are, as a rule, well over the summer water-level. Their vegetation is dense, but it is chiefly grass. Along this upper part of the river we pass the Belgian station of Kiru, picturesquely situated, but extremely unhealthy, if it is true that last year eight Europeans and three hundred native soldiers died there of fever. Gondokoro, well known as one of Sir Samuel Baker's stations, has recently been occupied by troops from Uganda.

Sir William Garstin devotes considerable space to a consideration of the "sadd" blocks, which until quite recently prevented the river from being navigated. On December 16, 1899, Major Peake left Omdurman with five gunboats and eight hundred Dervish prisoners, guarded by a hundred Sudanese soldiers, with the object of removing these obstacles to navigation. By March 27, 1900, he had succeeded in removing fourteen blocks, measuring 8000 meters in length, and holding 11,850 cubic meters. Blocks Nos. 16 to 19 were removed in January of the present year by Lieut. Drury, and an attempt is to be made in October to remove the only remaining block (No. 15), which will prove a difficult task, as it has attained a total length of 36 kilometers. The usual method pursued in removing these obstructions is to cut the surface into rectangular blocks of suitable size, hauling them out by steamers, and then letting them float down the river.

"Sadd" is a compacted mass of papyrus, Um suf, and the earth adhering to the roots of these reeds. Smaller swimming plants are mingled with it, but play no important part in the formation of the obstacle, still less does the light and brittle "ambach," which, moreover, is found but sparingly along the Bahr el Gebel.*

The formation of "sadd" is occasioned firstly by the direction of the river with reference to the prevailing south-easterly winds. Secondly, by the presence of large lagoons, surrounded by a dense growth of papyrus and Um suf to the windward. With the advent of the rainy season in April, the gales then arising uproot large masses of these reeds and set them floating upon the lagoons, their roots weighted by the earth clinging to them, hanging downwards, and striking again if

* The "sadd" of the Bahr el Ghazal, on the other hand, is chiefly composed of smaller swimming plants, and is consequently lighter in texture and less formidable than the "sadd" in the main river. Um suf, "mother of wool," seems to be vaguely applied to several species of reeds, including *Vossia procera* and *Phragmites communis*.

drifted into shallow water. If the stormy weather continues, large areas of marsh-vegetation are thus set in motion, and drift about at the mercy of the winds. If the river has overflown its banks, some of this vegetation may be drifted into its channel, when it floats down with the current until arrested by a sharp bend or at some narrow, funnel-shaped part of the river. As a result the river is quickly blocked up; the masses floating down from above are sucked underneath, until one solid block of tangled vegetation (and its adherent earth) fills up nearly the whole of the river-bed, leaving a narrow passage beneath, through which the confined waters rush with increased velocity. As a consequence of this obstruction, the level of the river above rises, until the pent-up waters have succeeded in escaping through a new channel, or a strong wind or the great volume of descending waters has carried the obstacle away.

Our sketches, Nos. 1–3 (see map), are designed to illustrate the formation of block No. 10, and after what has been just stated hardly require an explanation. Already on April 4 the lagoon was covered by floating vegetation. On April 7 and 8 it rained heavily, and strong gales from the south-east set the floating vegetation in motion towards the river, and finally forced it into it, so that by April 9 a solid block, shown in sketch No. 1, already extended across the river, its length being 500 meters, its thickness 5 meters at the lower end and 2 meters at the upper. Meanwhile the water above the block rose steadily until the difference of its level at the upper and lower ends amounted to 0·6 meter. Fresh masses of "sadd" came floating down the river, and were sucked below the existing obstruction; at the same time great masses of Um suf began to move upon the river, and by evening of April 11 a second block was formed above the original one, and the shallow channel from the lake to the river had been entirely closed, as shown in sketch No. 2. In the end the river channel above the block increased to a width of 320 meters, and in the afternoon of April 12 the river escaped through a channel formed along the eastern side of the block. All this while Major Peake and his people had been hard at work in removing this formidable obstacle, and at last, at 11 a.m. on the 13th, the last mass gave way, and the whole river surface was covered with floating masses of vegetation revolving and floating with the current. But so favourable are the conditions for the formation of "sadd" in this locality, that the river was once more obstructed on May 27, and again on June 10 (when it took thirty-two days to break up the block), and altogether eleven times in the course of the year, and it is only since December, 1900, that this part of the river has been freely open to navigation.

The measured discharge of the Bahr el Gebel, just above Lado, on March 29, 1901, was 622·962 cubic meters per second; at a spot 144 kilometers above Lake No, on April 1, 1901, it was 262·187 cubic meters.

A few days afterwards, on April 5, at a short distance above the Sobat, the discharge of the White Nile amounted to 294·221 cubic meters. Deducting these 294·221 cubic meters from the 622·962 cubic meters at Lado, we find a startling waste of 328·741 cubic meters, mainly due to the wide swamps bounding the river. It should be stated that all the above measurements of discharge were taken during low Nile, and that the full-flood discharges are very much more considerable, being estimated for Lado at 2000 cubic meters a second.

In discussing irrigation projects, Sir William confines his attention to the basins of the Bahr el Gebel and the Bahr el Azrak. Mr. Willcocks, late Director of Reservoirs in Egypt, first suggested in 1893 the utilization of the equatorial lakes as grand reservoirs for regulating the floods of the Nile. The suggestion is a tempting one. The Victoria Nyanza covers an area of 70,000 square kilometers, and if its waters could be artificially raised by only 1 meter, this lake alone would yield 70,000 million cubic meters of water, an amount far beyond any possible requirements. Sir William, nevertheless, abandons the idea of utilizing this lake, because he fears that a considerable rise of its water-level would flood large and populous areas of country, and that there might be difficulties with the German owners of the southern half of the lake. We need hardly say that a rise of the lake-level to the extent of 1 or even of 2 meters above its present level would not have the consequences feared by Sir William. Lake Albert, however, appears to him to offer all he requires, its only drawback being the fear of seismic disturbances, which one day may become more severe and sustained than they are now. That lake has an area of 5000 square kilometers, and by building a regulation dam it could without serious difficulty be raised to the extent of 3 meters, and afford thus storage for 15,000 million cubic meters of water. Allowing 1 meter for evaporation, there would still remain 4000 million cubic meters to meet the utmost requirements of Egypt, and 6000 million cubic meters for the Sudan. The water would be stored up during the rainy season, and discharged into the river during the months of low supply. But if such a scheme is to be realized, it is indispensable to regulate the Bahr el Gebel. Even now the channel of that river cannot hold and bring down the water actually existing in the river when at its lowest, and it certainly could not carry an extra volume. In order to confine the flood water within one single channel, it will be necessary to embank the river for its whole length between Bor and Lake No, a distance of 624 kilometers. If five years were to be allowed for the completion of such a scheme, its execution would involve an expenditure of £3,700,000! This scheme will have to be carried out if the Albert Nyanza is to be utilized as a reservoir for increasing the Nile supply, but if it is decided merely to secure the use of the water at present wasted in the marshes, a less ambitious scheme would prove sufficient. In that case

Sir William suggests the dredging and embankment of the Bahr el Zaraf throughout, and its use as an additional channel for the summer supply. Sir William admits that this scheme would not be as satisfactory as the embanking of the Bahr el Gebel throughout the length of the marshes, but it would involve an expenditure of only £1,250,000.

A third scheme is, however, put forward, and this Sir William evidently thinks preferable to either of the others. He proposes to convert Lake Tsana into a reservoir, and thus store sufficient water for the needs both of Egypt and the Sudan, and at the same time improve the navigation of the Blue Nile during the summer months. He supposes Lake Tsana to have an area of 3300 square kilometers (according to Dr. Stecker's survey, the area is only 2980 square kilometers). A rise of the lake of 5 meters would thus yield 16,500 million cubic meters. Allowing 3300 million cubic meters to be lost by evaporation, there would remain 4000 million for Egypt, whilst the balance could be made use of in the Sudan. No objection could be raised against this scheme, notwithstanding the fact that Sir William seems to be but imperfectly acquainted with the geographical features of the region with which he deals, if Lake Tsana were in the possession either of Egypt or of England. But who dare answer for the political future of Abyssinia? The Emperor Menelek might grant permission for the desired works to be carried out, but who can say what might be done by his successors? The destruction of a dam at the outlet of Lake Tsana might involve Dar Sennar in a great disaster. It certainly seems to us that something ought to be done for the irrigation of the rich alluvial soil extending for 700 kilometres along the Blue Nile from Rosaires to Khartum, but might not this object be attained more readily by building a dam across the Blue Nile above Rosaires, within Egyptian territory, and by damming up some of the "khors" which find their way into that river from the Abyssinian highlands?

THE LAKE-LEVEL OF THE VICTORIA NYANZA.

By E. G. RAVENSTEIN.

THE record of the lake-level of the Victoria Nyanza was begun in January, 1896, by direction of Sir Ernest J. L. Berkeley, Her Majesty's Commissioner. The execution of this inquiry was intrusted by him to Mr. R. J. D. Macallister. Gauges were erected at Ntebe (Port Alice), the lake port of the capital; at Lubwa's (now Fort Thruston), near the outlet of the Nile; and at Port Victoria, in Berkeley bay. Care was taken to secure solid foundations for these gauges, so as to prevent a subsequent settlement. It was deemed sufficient to observe the lake-level once daily. An arbitrary datum level had, as a matter of course,

to be adopted for each station, but all observations published in the Reports of the British Association have been reduced to the mean lake-level at each station for the year 1896 by deducting 15·5 inches from the recorded readings at Ntebe, 18·46 inches in the case of Fort Thruston, and 36·53 inches in that of Port Victoria. On October 1, 1898, Mr. C. W. Fowler, Superintendent of Marine, adjusted all observations to the readings taken at Port Victoria, and since that date 36·53 inches have been deducted for each of the three stations.

Owing to political troubles, no record was kept at either station during thirteen months, from the beginning of August, 1897, to the end of the same month, 1898; whilst from Fort Thruston there are no reports for an additional two months, namely, for November and December, 1899. At Port Victoria the observations were discontinued

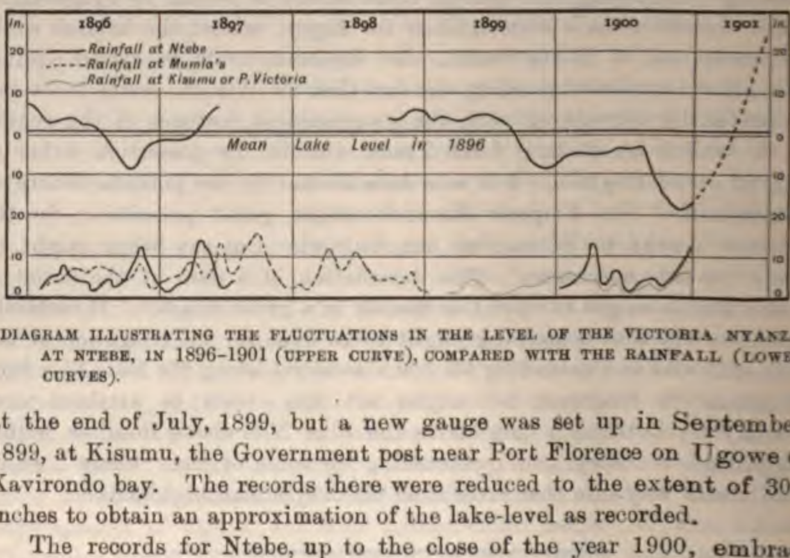

DIAGRAM ILLUSTRATING THE FLUCTUATIONS IN THE LEVEL OF THE VICTORIA NYANZA, AT NTEBE, IN 1896–1901 (UPPER CURVE), COMPARED WITH THE RAINFALL (LOWER CURVES).

at the end of July, 1899, but a new gauge was set up in September, 1899, at Kisumu, the Government post near Port Florence on Ugowe or Kavirondo bay. The records there were reduced to the extent of 30·3 inches to obtain an approximation of the lake-level as recorded.

The records for Ntebe, up to the close of the year 1900, embrace thus three full years and eleven months, those for Fort Thruston 45 months, for Port Victoria 30 months, and Kisumu 16 months.

The general results, as far as Ntebe is concerned, may be thus summarized:

	1896.	1899.	1900.
Mean lake-level ...	0·0	−0·51 in.	− 8·13 in.
Highest level ...	Jan. 1 + 8·5 in.	June 8 + 6·47 in.	July 21 − 2·03 in.
Lowest level ...	Oct. 10 − 10·0 in.	Nov. 28 − 10·03 in.	Nov. 21 − 19·53 in.
Range	18·5 in.	16·50 in.	17·50 in.

The lake-level, to judge from the incomplete returns available, fell in the course of 1897, rose again slightly in 1898, only to fall again in

1899, and still more in 1900, when it reached its lowest level apparently for many years past. In 1901, however, an almost startling recovery took place, and by June 1 of the present year its level had risen 24 inches above the mean level of 1896.* The extreme range since the beginning of 1896 has thus been 43·53 inches, but if there is any truth in what the Roman Catholic missionaries in Buganda told Mr. Macallister (see 'Egypt,' No. 2 (1901), p. 49), that the mean level of the lake twenty years ago (*i.e.* in 1881) exceeded that of the year 1898 to the extent of 8 feet, the extreme range, as far as our experience goes, may be assumed to amount to at least 10 feet. Under these circumstances, a permanent raising of the lake-level to that extent, by constructing a

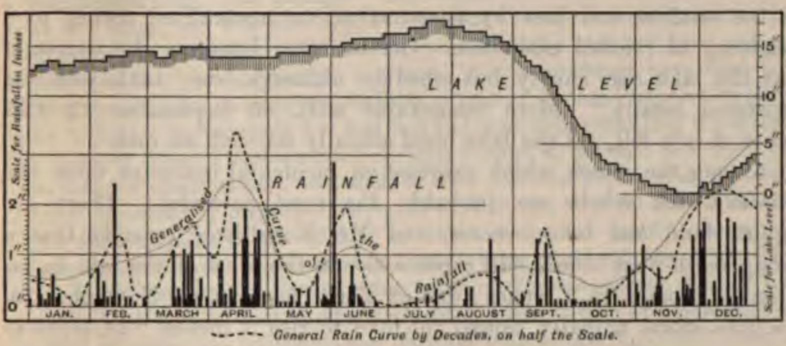

DIAGRAM ILLUSTRATING THE FLUCTUATIONS IN THE LEVEL OF THE VICTORIA NYANZA, AT NTEBE, IN 1900, COMPARED WITH THE RAINFALL.

regulating dam at Fort Thruston, is not likely to be attended by the disastrous consequences which seem to be dreaded by Sir W. Garstin.

The normal rise and fall of the lake-level is primarily governed by the rainfall throughout its catchment basin, and to a minor extent by differences in the amount of evaporation. A permanent fall of its level might even result from a natural deepening of the channel of the Nile where it leaves the lake. Of such a deepening, however, there is at present no evidence.

As to the rainfall, our information is still of a very fragmentary nature. We know, however, that the amount of rain varies not only with the succeeding seasons, but also locally. At Mengo, the capital of Buganda, 55 inches of rain fell in 1881, and only 35 inches in 1893. In the year 1894–5 90 inches were registered at the Bukoba station on the western shore of the lake, as compared with 49 inches on the southern extremity of the lake at Muanza. In 1897–8 73 inches fell at Bukoba, and 92 inches at Mumia's, in Kavirondo, towards the

* Sir William Garstin accounts for this sudden rise by supposing the sadd in the Kagira river to have been set free, thus producing a flood.

north-east. In the hills to the east of Mumia's the rain is known to be still heavier. In 1896–7 63 inches fell at Ntebe, 73 inches at Mumia's; in 1900 61 inches at Ntebe, and 49 at Kisumu. Many facts tend to prove that it is not local rains which appreciably affect what may be called the mean daily level of the lake, but precipitation throughout its vast drainage area.

A rainfall of 2·36 inches on November 14, 1896, only caused a rise of the lake to the extent of 0·75 inch, whilst the heavy rains during October and November (16·64 inches) only affected the lake to the extent of 5 inches. At Ntebe, between March 20–24, 1900, 3·7 inches of rain fell, and in the course of April 1 13·54 inches, yet the level of the lake remained unaffected, the heavy local rains being balanced by the outflow and loss by evaporation, or neutralized owing to a deficiency of rainfall elsewhere. On the other hand, in the course of May the lake rose slowly, but steadily, although very little rain was registered locally.* More remarkable still, on September 12 1·25 inches of rain fell, yet the lake-level actually fell half an inch.

Among the causes which exercise an incidental influence upon the lake-level the winds are probably the most powerful. There are regular land and lake breezes, and Mr. Macallister remarks that a strong south-west breeze will cause a rise in the level of the lake to an extent of from 1 to 3 inches; and at Fort Thruston, on November 13, a severe storm actually caused the lake to rise 3 inches. In order to ascertain the effect of the winds, it would be necessary to make at least three observations daily, or to set up a self-registering gauge.

Further fluctuations of the lake-level are undoubtedly due to differences of barometric pressure over parts of its surface, and there may be *seiches*, and perhaps even tidal movements. A successful study of these phenomena would necessitate the establishment of at least four gauges on the lake-shore (in the north, south, east, and west). These stations should be provided with self-registering apparatus, their altitudes should be determined by careful levelling, and the observations should, as a matter of course, embrace all the usual atmospheric phenomena.

The diagrams accompanying this notice explain themselves. For further information the reader is referred to the Reports of a committee of the British Association on the Climatology of Africa, of which the writer of this notice is chairman.

* At Fort Thruston between May 12 and 13 the lake rose four inches, although no rain fell.

ON RESEARCH IN GEOGRAPHICAL SCIENCE.*

By HUGH ROBERT MILL, D.Sc., LL.D., F.R.S.E.

Introductory.

The annual reassembling of friends and fellow-workers in the old re-visited towns, and the annual accession of new lovers of science, furnish a unique opportunity for a survey of the advances made in each department, a fitting occasion also for remembering those who have finished their work and can aid our deliberations only by the memory of their example.

Apart from our more intimate losses in the death of many distinguished geographers and devoted workers, the period since our last meeting has been for all a year of mourning. The passing of the nineteenth century was almost like the death of a friend, and it is still difficult to realize that the century which we had been so long in the habit of associating with everything new and great and progressive has itself become part of the past. Few coincidences have been more striking than the almost simultaneous close of that unparalleled reign which gave a name to the era including all that was best and most characteristic of the century. The death of Queen Victoria carried so keen a sense of personal loss into every heart that few attempts have been made to show how vast a portion of the stream of time—measured by progress—intervened between the terminal dates of her life. Think for a moment of the splendid advances in the one small department of geographical exploration during the late Queen's reign, the multitude of landmarks which have been crowned by the great name of Victoria—of the Earth's most southerly land and its most northerly sea, of the largest lake and most majestic waterfall of Africa, the loftiest lake of Asia, the highest peak in New Guinea, the widest desert and most populous colony in Australia, and of the two thriving seaports on either side of the North Pacific which couple together the British Dominions of western America and eastern Asia.

What could be more appropriate in this first meeting after the close of such a century and of such a reign than to pass in brief but appreciative review the advances of geography during those hundred or those sixty-five years? One thing, in my opinion, is more appropriate than to dwell on past triumphs or to regret past greatness, and that is to survey our present position and look ahead. In the first year of a new century and of a new reign we are reminded that we have a future to face and that the world is before us, and I propose to seize this opportunity in order to speak of the science of geography as it is now understood, and especially to urge the importance of the more systematic pursuit of geographical research henceforward.

Geography in the Universities.

The prospect of immediate expansion in many British universities seems at last likely to afford more than one opportunity of wiping out the old disgrace of the neglect of geographical science in the accredited seats of learning. Already Oxford has a well-manned School of Geography, and Cambridge has a Reader in Geography. The reconstituted University of London occupies the best position in the world for creating a chair of geographical research, situated as it is in the very centre of the comings and goings of all mankind, and in touch with the most

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* Presidential Address to the Geographical Section, British Association, Glasgow, 1901.

complete geographical library and map-collection in existence. The new University of Birmingham may, it is hoped, prove better than its promises, and may perhaps after all provide some more adequate treatment of geography than its proposed partition amongst the professors of half a dozen special subjects, all of them concerned in geography, it is true, but none of them individually, nor all of them collectively, capable of embodying that co-ordination of parts into a harmonious unity which gives to geography its power as a mental discipline and its value for practical application. But England, in all that pertains to higher education, is still a poor country, and the will to do well is hampered by the grinning demon of poverty. Here, on the other side of the border, we are in a different atmosphere. The wave of the magician's wand in the hands of Andrew Carnegie has brought wealth that last year would have been deemed fabulous to the ancient universities in Scotland, and it will be a disgrace to our country if this splendid generosity does not result in the establishment of one or more fully endowed and completely equipped chairs of geography.

There may still be some people who view geography as the concern only of soldiers and sailors, adventurous travellers, and perhaps of elementary teachers. Exploration is undoubtedly the first duty of geographers, but it is a duty which has been well done, the nineteenth century having left us only one problem of the first magnitude. This is the exploration of the polar regions, and even here the twentieth century clamours for new methods.

The Antarctic Expeditions.

This year has seen the long-hoped-for Antarctic Expeditions set out on their great quest, a quest not only of new lands in the southern ice-world, but of scientific information regarding all the conditions of that vast unknown region. Two expeditions have been planned in Great Britain and Germany with a complete interchange of information regarding equipment and methods of work. Provision has been made for simultaneous magnetic and meteorological observations, and, in some instances, for the use of instruments of identical construction, and all possibility of any unseemly rivalry in striving for the childish distinction of getting farthest south has been obviated by the friendly understanding that the British ship shall explore the already fairly known Ross quadrant, where it is pretty sure that extensive and accessible land will favour exploration by sledges, while the Germans have chosen the entirely unknown area of the Enderby quadrant which no ice-protected steamer has yet attempted to penetrate, and where they enter a region of potential discovery before they cross the antarctic circle.

The British expedition is equipped on the good old plan that produced such fine results in the days of Cook and Ross; it is manned by sailors of the Royal Navy, and is under the command of a gallant naval officer, though, unlike the earlier vessels, the *Discovery* is not herself a naval ship. As in the days of Cook, the naval officers are assisted in their non-professional work by several young and promising scientific men, two of whom have already had experience of work in the polar regions. These have the great advantage of the counsel and help of Mr. George Murray of the British Museum, who goes as far as Melbourne in the position of Director of the Scientific Staff.

No one who has seen the zeal and unflagging enthusiasm with which Sir Clements Markham has organized the expedition can hesitate to accord to him in fullest measure the credit for its successful inauguration. And no one who has seen the quiet and good-humoured determination of the commander, Commander R. F. Scott, in overcoming many irritating preliminary difficulties, can doubt his fitness to undertake the heavy responsibilities of the voyage. I am sure that he

will be a worthy successor to Cook, Ross, Franklin, Nares, and all the other officers who have made their names and the name of the British Navy famous in polar service. The second in command, Lieut. Armitage, R.N.R., has had several years of arctic experience, and amongst the crew there are some old whalers whose knowledge of the ways of sea-ice should prove of value. The ship and her equipment are unique; it is no exaggeration to say that she is the best-found and most comfortable vessel which has ever left our shores on a voyage of discovery.

The German expedition has been more boldly planned than ours. It is new and experimental all through, as befits a young nation in its first exuberant efforts in a new field. If some people suppose that it may have made mistakes that our expedition has avoided, these at least are new mistakes from which new lessons are to be learned. If risks must be run—and we of the twentieth century are, I trust, no more timid of incurring risks than our predecessors of the nineteenth, or the eighteenth, or even the seventeenth—it is good that they should be new risks. To scientific men in Germany it appears natural and reasonable that a man of science should be the head of a scientific expedition; and that a geographer should lead a geographical expedition. Many British men of science sympathize in this view. Dr. Erich von Drygalski, one of the professors of Geography in the University of Berlin, has been entrusted with the command, to which he was appointed before the ship was designed, and for five years he has given all his time and thought to the expedition. He is supported by a band of highly trained specialists, who have spared neither time nor travel in mastering the subjects with which they may deal, and each has also received a general training in the subjects of all his colleagues—an admirable precaution. The captain of the *Gauss*, who belongs to the Merchant Service, has taken a course of training from the Norwegian whalers off Spitsbergen. He will, of course, be absolute master of the ship and crew in all that concerns order and safety, but he will be under the direction of the leader in all that concerns the plan of the voyage and the execution of scientific work. This arrangement is one which has always seemed to me to be desirable, that the captain of a ship on scientific service should occupy a position in relation to the scientific chief similar to that of the captain of a yacht in relation to the owner; but it is subject to the drawback that a naval officer could not well be asked to accept such a divided command.

Whatever our views as to ideal organization may be, we are all certain that both expeditions will do the utmost that they can to justify the confidence that is placed in them, and to bring honour to their flags. We know that the officers and staff of the *Discovery* belong to a race which, whether trained in the University or in the Navy, has acquired the habit of bringing back splendid results from any quest that is undertaken.

A Definition of Geography.

The bright prospects of Antarctic Exploration must not, however, blind us to the fact that exploration is not geography, nor is the reading or even the writing of text-books, nor is the making of maps, despite the recognition of leading cartographers as "Geographers to the King." These are amongst the departments of geography, but the whole is greater than its parts.

The view of the scope and content of geography which I have arrived at as the result of much work and some little reading during twenty years is substantially that held by most modern geographers. But it is right to point out that the mode of expressing it may not be accepted without amendment by any of the recognized leaders of the science, and for my own part I believe that discussion rather than acceptance is the best fate that can befall any attempt at stating scientific truth.

Put in the fewest words, my opinion is that—

Geography is the science which deals with the forms of relief of the Earth's crust, and with the influence which these forms exercise on the distribution of all other phenomena.

This definition looks to the form and composition of the Earth's crust itself, and to the successive coverings, partial and complete, in which the stony globe is wrapped. We sometimes hear of the "New Geography," but I think it is more profitable to consider the present position of Geography as the outcome of the thought and labours of an unbroken chain of workers, continuously modified by the growth of knowledge, yet old in aim, old even in the expression of many of the ideas that we are apt to consider the most modern.

Some Historical Landmarks.

Claudius Ptolemæus, about 150 A.D., gathered into his great 'Geography' the whole outcome of the Greek study of the habitable world. He laid stress on the threefold nature of descriptions of the Earth's surface, the general sketch of the great features of the world alone receiving the name of Geography, the more special description of an area he termed Chorography, and the detailed account of a particular place Topography.

Aristotle, who first adduced real proofs of the sphericity of the Earth, had not failed to note the relationships which exist between plants and animals, and the places in which they are found, and he argued that the character of peoples was influenced by the land in which they lived; but Ptolemy cared little for theories, comparisons, or relationships, confining himself rather to the record of actual facts. He made errors, the results of which were more important, as it happened, in advancing knowledge than were the truths which he recorded; for after the troubled mediæval sleep, when even the spherical form of the Earth was blotted out of the knowledge of Christendom, the scientific deductions made by Toscanelli from the false premises of Ptolemy heartened Columbus for his westward voyage to the Indies, on the very outset of which he stumbled all unknowing on the New World. When Magellan succeeded in the enterprise which Columbus had commenced, the fourteen centuries' reign of Ptolemy in geography came to an end; his work was done.

The rapid unveiling of the Earth in the sixteenth and seventeenth centuries cast a glamour over feats of exploration which has not yet been wholly dissipated, and it may not be easy, even now, to obtain wide credence for the fact that the explorer is usually but the collector of raw material for the geographer.

It is of vital interest to trace the re-formation of the theory of geography after its interruption in the Middle Ages. The fragments of the old Greek lore were cemented together by new and plastic thoughts, crudely enough by Apian, Gemma Frisius, and Sebastian Munster in the sixteenth century, but with increasing strength and completeness by Cluverius, Carpenter, and Varenius in the seventeenth.

The First Oxford Geographer.

The names of Cluverius and Varenius are familiar to every historian of geography, but that of Carpenter, I am afraid, is now brought to the notice of many geographical students for the first time. He was not so great as Varenius, but he was the first British geographer to write on theoretical geography as distinguished from mathematical treatises on navigation or the repetition of narratives of travel, and I think that there is evidence to show that his work had an influence on his great Dutch contemporary.

Nathanael Carpenter, Fellow of Exeter College, Oxford, published his book in 1625 under the title—

'Geographie delineated forth in two Bookes. Containing the Sphericall and Topicall parts thereof,' and with the motto from Ecclesiastes on its title-page—

"One generation commeth, and another goeth, but the Earth remayneth for ever."

The great merits of Carpenter's treatise are his firm grasp of the relation of one part of geography to another, his skilful blending of the solid part of the work of Aristotle and Ptolemy with that of the explorers and investigators of his own generation, and the wholesome common sense that dominates his reasoning. His definition is comprehensive and précise.

"Geographie is a science which teacheth the description of the whole Earth. The Nature of *Geographie* is well expressed in the name: For *Geographie* resolved according to the *Greeke* Etymologie signifieth as much as a description of the Earth; so that it differs from *Cosmographie*, as a part from the whole. Forasmuch as *Cosmographie* according to the name is a description of the whole world, comprehending under it as well *Geographie* as *Astronomie*. Howbeit, I confesse, that amongst the ancient Writers, *Cosmographie* has been taken for one and the self-same science with *Geographie* as may appeare by sundry treatises meerely Geographicall, yet intituled by the name of *Cosmographie*."

The differences held by Ptolemy to distinguish geography from chorography Carpenter shows to be merely accidental, not essential, and as to geography he says, "It is properly tearmed a *Science*, because it proposeth to it selfe no other end but knowledge; whereas those faculties are commonly tearmed *Arts*, which are not contented with a bare knowledge or speculation, but are directed to some farther work or action. But here a doubt seems to arise, whether this *Science* be to be esteemed *Physicall* or *Mathematicall?* Wee answer, that in a Science two things are to be considered: first, the *matter* or object whereabout it is conversant; secondly, the *manner* of handling and explication: For the former no doubt can bee made but that the object in *Geographie* is for the most part *Physicall* consisting of the parts whereof the Spheare is composed; but for the manner of Explication it is not *pure* but *mixt;* as in the former part *Mathematicall*, in the second rather *Historicall;* whence the whole Science may be alike tearmed both *Mathematicall & Historicall;* not in respect of the *subject* which we have said to be *Physicall* but in the manner of *Explication*."

Although somewhat diffuse in expression, the meaning of these statements is clear and sound, and to the British public as new now as it was in the days of King Charles. The book treats of mathematical geography and cartography, of magnetism, climates, the nature of places, of hydrography including the sea, rivers, lakes and fountains, of mountains, valleys and woods, of islands and continents, and at considerable length of people and the way in which they are influenced by the land in which they live. Whether Dr. Carpenter lectured on geography in Oxford I do not know, but his book must have acquired a certain currency, for a second edition appeared in 1635, and it seems probable that it was known to Varenius.

Varenius and Newton.

Varenius, a young man who died at twenty-eight, produced in Latin a single small volume published in 1650, which is a model of conciseness of expression and logical arrangement well worthy even now of literal translation into English. So highly was it thought of at the time that Sir Isaac Newton brought out an annotated Latin edition at Cambridge in 1672.* The opening definition as rendered in

* Dugdale, in the introduction to the English translation published in 1733, states explicitly that Newton produced his version for the benefit of the students attending

the English translation of 1733 (a work spoilt in most places by a parasitic growth of notes and interpolations) runs :—

"Geography is that part of *mixed mathematics* which explains the state of the Earth and of its parts, depending on quantity, viz. its figure, place, magnitude and motion with the celestial appearances, etc. By some it is taken in too limited a sense, for a bare description of the several countries; and by others too extensively, who along with such a description would have their political constitution."

Varenius produced a framework of Physical Geography capable of including new facts of discovery as they arose, and it is no wonder that his work, although but a part, ruled unchallenged as the standard text-book of pure geography for more than a century. He laid stress on the causes and effects of phenomena as well as the mere fact of their occurrence, and he clearly recognized the vast importance upon different distributions of the vertical relief of the land. He did not treat of human relations in geography, but, under protest, gave a scheme for discussing them as a concession to popular demands.

Kant.

As Isaac Newton, the mathematician, had turned his attention to geography at Cambridge in the earlier part of the eighteenth century, so Immanuel Kant, the philosopher, lectured on the same subject at Königsberg in the later part. The fame of Kant as a metaphysician has defrauded him of much of the honour that is his due as a man of science. As Prof. Hastie puts it: "His earlier scientific work, like an inner planet merged in light, was thus almost entirely lost sight of in the blaze of his later philosophical splendour."

Kant, it will be remembered, considered that the communication of experience from one person to another fell into two categories, the historical and the geographical: that is to say, descriptions in order of time or in order of space. The science of geography he considered to be fundamentally physical, but physical geography formed the introduction and key to all other possible geographies, of which he enumerated five: *mathematical*, concerned with the form, size, and movements of the Earth and its place in the solar system; *moral*, taking account of the customs and characters of mankind according to their physical surroundings; *political*, concerning the divisions of the land into the territories of organized governments; *mercantile*, or, as we now call it, commercial geography; and *theological*, which took account of the distribution of religions. It is not so much the cleavage of geography into five branches, all springing from physical geography like the fingers from a hand, which is worthy of remark, but rather the recognition of the interaction of the conditions of physical geography with all other geographical conditions. The scheme of geography thus acquired a unity and a flexibility which it had not previously attained, but Kant's views have never received wide recognition. If his geographical lectures have been translated, no English or French edition has come under my notice, and such currency as they obtained in Germany was checked by the more concrete and brilliant work of Humboldt, and the teleological system elaborated in overwhelming detail by Ritter.

The teleological views of Ritter were substantially those of Paley. The world, he found, fitted its inhabitants so well that it was obviously made for them down to the minutest detail. The theory was one peculiarly acceptable in the early decades of the nineteenth century, and it had the immensely important result of

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his lectures "on the same subject" from the Lucasian chair; but we have been unable to find any more satisfactory evidence that Newton actually lectured on Geography at Cambridge.

leading men to view the Earth as a great unit, with all its parts co-ordinated to one end. It gave a philosophical, we may even say a theological, character to the study of geography.

Kant's views had pointed to such a unity, but from another side, that of evolution. It was not until after Charles Darwin had fully restored the doctrine of evolution to modern thought that it was forced upon thinking men that the fitness of the Earth to its inhabitants might result not from its being made for them, but from their having been shaped by it. It is certain that the influence of the terrestrial environment upon the life of a people has been carried too far by some writers—by Buckle, in his 'History of Civilization,' for example—but it is no less certain that this influence is a potent one.

The Nature of Geography.

Granted that such influence is exercised, some objectors may urge that geography has nothing to do with the matter, and we are compelled to acknowledge that the meaning and contents of geography are in this country as variously interpreted as the colour of the chameleon in the traveller's tale. Yet my thesis is that it is just this relation between the forms of the solid crust of the Earth and all the other phenomena of the surface that constitutes the very essence of geography.

It is a fact that many branches of the study of the Earth's surface which were included in the cosmography of the sixteenth century, the physiography of Linnæus, the physical geography of Humboldt, and perhaps even the *Erdkunde* of Ritter, have been elaborated by specialists into studies which, for their full comprehension, require the whole attention of the student. Geology, meteorology, oceanography, and anthropology, for example, have been successively specialized out of geography; but it does not follow that these specializations fully occupy the place of geography, for that place is to co-ordinate and correlate all the special facts concerned so that they may throw light on the plan and the processes of the Earth and its inhabitants. Geography is concerned with the results, not with the processes of the special sciences, and the limits between geography and geology, to take a single instance, are to be drawn, not between any one class of phenomena and another, but between one way and another of marshalling and utilizing the same facts. This was clear to Carpenter in 1625, though we have almost forgotten both it and him.

The Principles of Geography.

The principles of geography—the "pleasant principles," to use the phrase of old William Cuningham in 1559—on which its claims to status as a science rest, are generally agreed upon by modern geographers, though with such variations as arise from differences of standpoint and of mental process. The evolutionary idea is unifying geography as it has unified biology, and the whole complicated subject may be presented as the result of continuous progressive change brought about and guided by the influence of external conditions. These views have been often expressed in recent years, but they do not seem to have been very seriously considered, and no excuse need be offered for presenting them once more, though in an epitome curt to baldness.

The science of geography is of course based on the mathematical properties of a rotating sphere; but if we define geography as the exact and organized knowledge of the distribution of phenomena on the surface of the Earth, we see the force of Kant's classification, which subordinated mathematical to physical geography. The vertical relief of the Earth's crust shows us the grand and fundamental contrast

between the oceanic hollow and the continental ridges; and the hydrosphere is so guided by gravitation as to fill the hollow and rise upon the slopes of the ridges to a height depending on its volume, thus introducing the great superficial separation into land and sea. The movements of the water of the ocean are guided in every particular by the relief of the sea-bed and the configuration of the coast-lines. Even the distribution of the atmosphere over the Earth's surface is affected by the relief of the crust, the direction and force of the winds being largely dominated by the form of the land over which they blow. The different physical constitution of land, water, and air, especially the great difference between the specific heat and conductivity or diathermancy of the three, causes changes in the distribution of the sun's heat, and as a result the simple climatic zones and rhythmic seasons of the mathematical sphere are distorted out of all their primitive simplicity. The whole irregular distribution of rainfall and aridity, of permanent, seasonal, and variable winds, of sea-climate and land climate, is the resultant of the guiding action of land forms on the air and water currents, disturbed in this way from their primitive theoretical circulation. So far we see the surface forms of the Earth, themselves largely the result of the action of climatic forces, and constantly undergoing change in a definite direction, controlling the two great systems of fluid circulation. These in turn control the distribution of plants and animals, in conjunction with the direct action of surface relief, the natural regions and climatic belts dictating the distribution of living creatures. A more complicated state of things is found when the combined physical and biological environment is studied in its incidence on the distribution of the human race, the areas of human settlement, and the lines of human communications. The complication arises partly from the fact that each of the successive earlier environments acts both independently and collectively; but the difficulty is in greater degree due to the circumstance that man alone amongst animals is capable of reacting on his environment and deliberately modifying the conditions which control him.

It seems to me that the glory of geography as a science, the fascination of geography as a study, and the value of geography in practical affairs, are all due to the recognition of this unifying influence of surface relief in controlling, though in the higher developments rather by suggestion than dictation, the incidence of every mobile distribution on the Earth's surface.

The Classification of Geography.

Following out this idea, we are led to a classification of the field of geography in a natural order, in which every department arises out of the preceding with no absolute line of demarcation, and merges into the succeeding in the same way. This classification, it is necessary to note, is not like a series of pigeon-holes, which may be placed in any arbitrary order, but like a chain, in which the succession of the links is essential and unalterable.

Since form and dimension are the first and fundamental concepts in geography, the first and basal division is the *Mathematical*. Mathematical geography leaves the Earth as a spinning ball lighted and warmed according to a rigid succession of diurnal and annual changes. This merges into the domain of *Physical Geography*, which involves the results of contemporary change in the crust and the circulation of the fluid envelopes, with the resulting modifications in the simple and predictable mathematical distributions. This division falls naturally into three parts: Geomorphology, dealing with the forms of the solid crust and the changes they are undergoing at the present time; Oceanography, dealing with the great masses of water in the world; and Climatology, dealing with the effects of solar energy in the air. But all three spheres—lithosphere, hydrosphere, and atmosphere—are so

closely interrelated that no one of them can be studied without some preliminary knowledge of the others. This forms the largest and most important part of geography, more varied and intricate than the mathematical, better known and more definite than those involving life.

Bio-geography, the geographical distribution of life, arises directly from physical geography, which dominates it, but it is full of complex questions which involve the biological nature of the organism and the influence of physical environment, in which geographical elements, although predominant, do not act alone. Difficult as some of the problems of the distribution of life are at the present day, the remains of living creatures found fossil in the rocks, and the survivors of archaic forms still lingering in remote islands, supply us with our only instrument of research into the geography of past ages, often making it possible to lay down the areas of land and water in earlier geological periods.

The relation of man to the surface of the Earth detaches itself from the rest of Bio-geography by the number of exceptions to general laws of distribution and by the human power of modifying environment. It has necessarily been formed into a special department, *Anthropo-geography*. In primitive man the control exercised by environment is nearly as complete and simple as in the case of the lower animals; but with every advance in culture fresh complications are introduced. The relation of people to the land they inhabit, the choice of sites for dwellings and towns, the planning and carrying into effect of lines of communication, are all obviously much under the control of land form and climate. When people get settled in a favourable position they usually become attached to it; they acquire, one may say, the colour of the land, in modes of thought as well as in manner of life. The poems of Ossian and the Crofter Question require for their elucidation a knowledge of the geographical conditions of the Western Highlands, just as the Border ballads and the Border raids were largely conditioned by the geography of the Southern Uplands.

Attachment to the native valley or the native fields leads to the holding of land by clans or tribes and the fusion of tribes into nations, while changes in physical conditions stimulating migration from a deteriorating country may lead to the invasion of settled territories by homeless hordes. Here Anthropogeography buds off the subdivision of *Political Geography*, which takes account of the artificial boundaries separating or subdividing countries, and of the innumerable artificial restrictions and ameliorations which are superimposed on the natural barriers and channels of intercommunication. Even in political geography only a humble place is held by a statement of boundaries and capitals, to lists of which the great name of Geography has actually been confined by people who ought to have known better.

Anthropogeography views the world from the standpoint of the race, political geography from the standpoint of the nation; but room has to be found for a yet more restricted outlook, that of the individual, whose view of the world as it profits himself is known as commercial geography. This department deals with natural commodities and their interchange, and perhaps because here rather than in the other departments a successful comprehension of the inter-relation of cause and effect may be, in the language of the schoolroom, "reduced to pounds, shillings, and pence," the name of Applied Geography has been proposed. It fitly terminates our survey of the science, for the flickering disturbances of the equilibrium of supply and demand known simultaneously over the whole world, and the slower movements of transport to restore equilibrium, are still far from the power of scientific prevision, and all we can do at present is to point out certain clear lines of least resistance, or greatest advantage, due to the interactions of natural and human causes and effects.

To sum up in a sentence the field and the function of geography in the broad majesty of its completeness, we may say that it is the description of the surface of the solid Earth as it is in itself, as it acts upon the ocean, the air, and the living things which inhabit it, and as it is affected in turn by their actions.

Geography and the State.

Viewed thus I believe that geography will be found to afford an important clue to the solution of every problem affecting the mutual relations of land and people, enlightening the course of history, anticipating the trend of political movements, indicating the direction of sound industrial and commercial development.

It would be possible, unfortunately it would be easy, to enumerate misconceptions of history, blunders in boundary settlements, errors in foreign policy, useless and wasteful wars, mistakes in legislation, failures in commercial enterprise, lost opportunities in every sphere, which are due to the neglect of such a theoretical geography. Surely it is to the laws defining the interaction of Nature and Man that we should turn for guidance in such affairs, rather than to the dull old British doctrine of "muddling through." That vaunted process after all means that we are driven by stress of facts to do without intending it or knowing how, and at immense expense, the very things that intelligent study beforehand would have shown to be necessary, feasible, and cheap.

All this has been urged again and again, and it has fallen on the ears of those in authority "like a tale of little meaning though the words are strong." I admit that all advocates of a rational geography have not escaped the danger of the special pleader—they have promised too much. If a Government official were to say, "Yes, I confess there was a mistake here, the affair was managed badly, much money and some prestige were lost; it must all be done over again; please tell me how," I am afraid that the chances are that the answer would be vague, general, and unpractical. If the answer to this boldly hypothetical question is ever to be clear and definite, geography must be studied as it has never yet been studied in this country. It must pass beyond the stage of a recreation for retired officers, colonial officials, and persons of leisure, and become the object of intense whole-hearted and original study by men of no less ability who are willing to devote, not their leisure but their whole time to the work. The object of geographical research should be nothing less than the demonstration or refutation of what we claim to be the central principle of geography—that the forms of terrestrial relief control all mobile distributions.

A Projected Geographical Description.

In order to focus the question it may be convenient to consider the geography—or chorography, as Ptolemy would have termed it—of the British Islands. No author has ever attempted to give such a description. Camden's 'Britannia' was swamped by archæology; the county histories, which are certainly not deficient in number, were wrecked outward bound on the harbour-bar of genealogy. Sir John Sinclair's old 'New Statistical Account of Scotland' in the intelligent utilization of very incomplete data was a great but solitary stride in the right direction. Bartholomew's great 'Atlas of Scotland' supplies the cartographical basis for a modern description of the northern kingdom; but the description itself has not been undertaken on an equal scale. The work of producing a complete geographical description of the British Islands would be gigantic, but not hopelessly difficult.

The material has been collected at an enormous expenditure of public money, and is stacked more or less accessibly, much of it well-seasoned, some I fear spoilt

by keeping; but there it lies in overwhelming abundance, heaps of building materials, but requiring the labour of the builder before it can become a building.

There is first and chief the Ordnance Survey, one of the grandest pieces of work in mathematical geography that has ever been accomplished. The result is a series of maps almost as perfect as one can expect any human work to be, showing in a variety of scales from $\frac{1}{4}$ of an inch to 25 inches to a mile every feature of the configuration of the land—except the lake-beds.

There is next the hydrographic survey by the Admiralty, giving every detail of the subaqueous configuration in and around our islands—except the lake-beds.

These two great surveys supply the basis for a complete description of the British Islands, and the geological survey, which in a sense is more elaborate than either of the others, completes the fundamental part. The geological map makes it possible to explain many of the forms of the land by referring to the structure of the rocks which compose them. Both the geological and hydrographic surveys are accompanied by memoirs describing the features and discussing the various questions arising from the character of each sheet; but there is nothing of the kind for the maps of the ordnance survey.

The ordnance maps show at the date of their preparation the extent and also the nature of the woodlands and moorlands, and this information is supplemented by the Returns of the Board of Agriculture, which each year contain the statistics of farm crops, waste land, and livestock for every county. These returns are excellently edited from the statistical point of view, but they are not discussed geographically. It is easy to see in any year how much wheat is raised in each county, but it is a slow and laborious process to discover from the Returns what are the chief wheat-growing areas of the country. The county is too large a unit for geographical study, as it usually includes many types of land form and of geological formation. Before the distribution of crops can be understood or compared with the features of the ground they must be broken up into parishes, or even smaller units, and the results placed on maps and generalized. The vast labour of collecting and printing the data is undertaken by Government, and paid for by the people without a murmur, but the geographer is left in ignorance for the want of a comparatively cheap and simple cartographic representation of the facts.

The Inspectors of Mines and the Board of Trade publish statistics of the industry and the commerce of the country, statistically excellent, no doubt, but in most cases lacking the cartographic expression which makes it possible to take in the general state of the country from year to year. The same is true of the Registrar-General's Returns of births, marriages, and deaths, in themselves an admirable epitome of the health conditions of the country, and of the fluctuations in population, but limited by a narrow specialism to the one purpose.

Finally and chiefly we have the Census Report. Once in ten years the people are numbered and described by sex, age, and occupation. The inhabited houses are numbered, and the smaller dwellings grouped according to size. The figures are most elaborately classified and discussed, so as to bring out the distribution of population, and its change from the previous decade. But to the geographer the Census Reports are like a cornfield to a seeker of bread. The grains must be gathered, prepared, and elaborated before the desired result is obtained. Nowhere is the cartographic method more useful than here. It is a striking contrast to turn to the splendid volumes of the United States Census Reports, many of them statistically inferior to ours, but thickly illustrated with maps, showing at a glance the distribution of every condition which is dealt with, and enabling one to

follow decade by decade the progressive development of the country, and to study for each census the relations between the various conditions.

These are only a few of the statistical publications, produced by Government, and embodying year after year a mass of conscientious labour, which, save for a few specialists who extract and utilize what concerns themselves, is annually "cast as rubbish to the void."

One small department, supported by public money, but under unofficial direction, may be referred to as an example of the successful employment of cartographic methods. This is the Meteorological Council, appointed by the Royal Society, and charged with the collection of meteorological data and the publication of weather reports, forecasts, and storm warnings. The maps, published twice daily to show the distribution of atmospheric pressure and temperature, are only rough sketches and very much generalized, yet they serve the purpose of presenting the facts in a graphic form, yielding at a glance information which could only be extracted from tables by long and laborious efforts. The pilot charts, published monthly by the same department, showing the average conditions of air and sea over the whole North Atlantic, and the occasional atlases of oceanographical data, are valuable geographical material.

The official work of Government is supplemented by the voluntary labours of many societies, in whose Transactions much valuable material is stored, and in not a few cases is well discussed. But even with these supplements gaps remain which must be filled by private enterprise before a complete geographical description can be compiled.

Considering the Ordnance Survey alone, it is hardly credible and not at all creditable that the Treasury should veto the extension of the survey to the lake-beds on the score of expense, yet such is the fact. The directors of the Survey have shown themselves ready to encourage private workers by placing the data presented by them upon the maps with due acknowledgment.

The Survey of the Lakes.

It is with profound satisfaction that I now make an announcement—by special favour, the first public announcement—of a scheme of geographical research on a national scale by private enterprise. Sir John Murray and Mr. Laurence Pullar have resolved to complete the bathymetrical survey of all the fresh-water lakes of the British Islands. Mr. Laurence Pullar will take an active part in the proposed Survey, and has made over to trustees a sum of money sufficient to enable the investigation to be commenced forthwith, and to be carried through in a comprehensive and thorough manner. It is intended to make the finished work an appropriate and worthy memorial of Mr. Pullar's son, the late Mr. Fred Pullar, who had entered enthusiastically upon the survey of the lochs of Scotland, and whose heroic death while endeavouring to save life in Airthrey loch last February must be present to the memory of many of you. Large sums of money devoted in good faith to scientific purposes do not always bring about the wished-for result; but in this case there is no room for anxiety on that score. Sir John Murray, with whom Mr. Fred Pullar had worked for several years, has generously promised to direct the whole scheme, and to be responsible for carrying it out. All the lakes of the British Islands will be sounded and mapped as a preliminary to the complete limnological investigation which is proposed. The nature of the deposits, the chemical composition of the water and its dissolved gases, the rainfall of the drainage areas, the volumes of the inflowing and outflowing streams, the fluctuations in the level of the surface, the seasonal changes of temperature, and the nature and distribution of aquatic plants and animals, will all receive attention. The geological

history of the lakes may also be inquired into with reference to such points as the growth of deltas, the erosion of the margins, and, perhaps, the conditions of the old dead lakes that are now level meadows.

Five years at least will be required to make these observations and to incorporate them in memoirs, each of which will be a complete natural history of the lakes of one river-basin. The proposed work wants more than money, direction, and time. It requires the services of several young and enthusiastic workers—preferably men who have completed their university course and are anxious to devote some time to research. Sir John Murray and Mr. Pullar wish to meet three or four capable young fellows, one preferably a chemist, one a geologist, one a botanist, and one a zoologist. When found they will be offered a salary sufficient to enable them to give their whole time to the work, but not large enough to induce any one who has not the love of science at heart to take it up. From my experience when working in somewhat similar conditions at the Scottish Marine Station seventeen years ago, I can promise those who will have the good fortune to be selected plenty of hard work, for which they will get the fullest credit—and this they will appreciate more keenly when they come to know the world better—and I can promise them also in their association with Sir John Murray a course of scientific and intellectual training such as even the universities do not afford.

Other Desirable Surveys.

The Geological Map requires to be supplemented by additional work on the nature of the superficial soil as it affects agriculture, such as is expressed in the *Cartes agronomiques* of France, going more fully into the chemical nature of the soil than is possible on the Drift Maps of the Survey which so usefully supplement the maps of solid geology. Such experiments as have been made at the College at Reading in collecting analyses of the soils in the neighbourhood might very well be carried out at the agricultural colleges and other centres all over the country.

Of equal value, though, perhaps, more obviously so to the scientific than to the "practical" man, is the study of the natural vegetation of the country. In a highly cultivated land like ours there are comparatively few places where the native flora remains in possession, but the mapping of the main crops which have supplanted it is nearly as useful. To become satisfactory from this point of view, the statistics of the Board of Agriculture ought to be supplemented by surveys made by trained botanists on the ground. A valuable beginning has been made under the ever-fertile stimulus of Prof. Patrick Geddes in the two sheets of a map of the plant-associations of Scotland, compiled by the late Robert Smith, whose premature death last year was a loss to science. It would be a splendid thing if this map could be finished as a memorial to the brilliant young botanist in the same way as the survey of the lakes is proposed as a memorial worthy of Fred Pullar, and I am glad to learn that there is some probability of it being carried on.

Of all the other distributions which might be worked out cartographically time fails us to speak; but reference must be made, however briefly, to a few.

Geography of the Air.

With regard to Meteorology, the distribution of temperature and pressure over the British Islands for the year and for the separate months have been worked out by the experienced hand of Dr. Buchan and published both in separate memoirs and in the 'Meteorological Atlas,' edited by Dr. Buchan and Dr. Herbertson. But such observations as the degree of cloud or of sunshine can, as yet, be treated only in a superficial and generalized way for want of data. Perhaps the most important

and certainly the most difficult of all the atmospheric conditions to discuss fully is precipitation. It depends on so many varying conditions, such as the form and exposure of the land, the altitude above sea-level, the direction and force of the wind, the relative frequency of thunderstorms, the distance from the sea, the direction of the average paths of cyclonic storms, etc., that far more numerous and more long-continued observations are required to establish the normal condition of the country than in the case of either temperature or pressure. When we reflect that the whole water-supply of the country depends directly on rainfall, and when we remember that the value of water-power made available by differences of level promises to be greater in the future than it has been in the past, we can see that a study of rainfall in conjunction with configuration may prove as valuable for the localization of the manufacturing centres of the future as the geological survey was for those of the present.

Thanks to the remarkable foresight and the untiring exertions of the late Mr. Symons, the volunteer rainfall observers of this country have been encouraged to organize their efforts, and by working on a common plan have accumulated within the last forty years a mass of observations unrivalled for number and completeness in any other land. But as yet the difficulties in the way of constructing a map of normal rainfall on an adequate scale have not been overcome, and much experimental work will probably be necessary before it can be accomplished. To this task it is my ambition to devote myself. I may be permitted to state that Scotland is far behind England or Wales in the number of rainfall stations per square mile. Thus there is, roughly, one rain-observing station for every 20 square miles of England, one for every 30 square miles of Wales, but only one for every 67 square miles of Scotland, and one for every 170 square miles of Ireland.

Rainfall observations only tell the amount of available water; the configuration of the stream-beds must be considered in determining water-power. The only country I know where the horse-power of the rivers has been measured and mapped is Finland; but, of course, individual rivers, such as the Mississippi, Rhine, Seine, and Thames, have been thoroughly studied. Before many decades have passed it will be a necessary element in the surveys of all countries, though at present the available data are few and scattered.

Population Maps.

In considering human geography we come to the most interesting and least occupied field of research. Until Mr. Bosse constructed his beautiful maps of the density of population of Scotland and England, we had absolutely no cartographical representation of the true distribution of people over the land. To map population by counties gives a very poor idea of the truth, for in such counties as Yorkshire or Perthshire there are large areas entirely without inhabitants, and small areas where the population is very dense. Mr. Bosse's maps were made on the principle of leaving blank all the land on which there were no dwelling-houses, and so obtaining a close approximation to the true density of population of the inhabited area. For Scotland his map shows at once that it is a function of configuration. It shows the densely peopled lowland plain, the less densely peopled coast-strip surrounding the country, and the least densely peopled valleys running inland into the great uninhabited areas. The population map of England, on the other hand, shows an absolutely startling relation to the geological structure, which in turn is closely related to the configuration. We are not astonished to see the centres of densest population coinciding with the Coal Measures, but it is both surprising and instructive to see how the density of population runs parallel to the strike of the Secondary and Tertiary rocks of south-eastern England, a

band of the lightest population following each outcrop of chalk and limestone, a band of dense population following each belt of sandstone or clay.

Anthropo-geography teems with fascinating subjects of research. The admirable investigations in the west of Ireland on the physical anthropology of the people might well be extended to the whole country outside the great towns, where all evidence of place of origin and original character is speedily lost. Good work has been done in this way by the Ethnographic Survey promoted by a committee of this Association, and a committee of the Royal Scottish Geographical Society has rendered great aid to the Ordnance Survey in the cognate study of the place-names of Scotland.

The distribution of religion, even in the three typical forms of Anglican, Presbyterian, and Roman Catholic—forms so typical as to be, broadly speaking, national—is most imperfectly known. The objection to a religious census is one which is somewhat difficult of comprehension in Scotland, and too polemic for sober discussion in England. But a few of the problems are worth being worked out by individuals. The curious islands of Roman Catholic continuity in Lancashire, the Hebrides, and the Highlands, can probably be related simply enough to the configuration of the country and the means of communication as influencing free movement of people at critical periods of history. There are many interesting points as to the geographical distribution of surnames, the relation of characteristic literature or poetry to specific areas; things small in themselves, but capable of very far-reaching influence if systematically worked out.

Geographical Synthesis.

Granted that the subsidiary surveys have been made and the results put in a strictly comparable form, the central problem remains—the synthesis of the complete geography of the country. This can perhaps be solved best by comparing the maps of the various distributions in the proper order, and seeing how far they are related to one another. For the general discussion the Ordnance Map on the scale of 1 inch to a mile should be used, and each natural region ought properly to be treated by itself, but as a matter of practical convenience it would probably be found best to select either the artificial boundaries of counties or the still more arbitrary lines bounding sheets of the map. Whatever small area is taken as the unit of description, it should be treated in such a way as to seek for and prove or disprove the existence of any control exercised by the form of the land and its geological character on the outcrops of the rocks, the nature of the soil, the course of the rivers, the temperature and movements of the air, the rainfall, the vegetation and agriculture, the distribution of population, the sites of towns, villages, and isolated dwellings, the roads, railways and harbours, the birth-rate and death-rate, and on the progressive changes in all these conditions which are shown in the discussion of the statistics collected annually or decennially. When such unit areas are worked out individually the results can easily be combined and condensed into a geographical description that will be complete, well balanced, and symmetrical. The work is practicable; it requires only time, money, direction and workers to carry it out; but although a specimen memoir, prepared by the authority of the Royal Geographical Society, met with a certain measure of approval, all attempts failed to obtain funds for making the work complete, and the scheme must await a more educated generation before it can be profitably revived in its entirety. Meanwhile this field for geographical study and research lies at the doors of every university where the subject is or may be recognized, and the labours of professors and students might be profitably directed to the completion of such memoirs for the surrounding district, gradually working further

and further afield. The idea is no more new than every other "thing under t sun." Such exercises, not so elaborately planned, but the same in essentials, w ordinary subjects for theses in the universities of Sweden and Finland during t eighteenth century. To come nearer home, the local handbooks prepared successive meetings of the British Association are frequently very fair examp of the geographical description of a district. The essential qualities are rarer guide-books; but we must not forget one brilliant exception, the poet Wor worth's 'Guide to the English Lakes.'

It is pleasant to hear that through the encouragement of Sir John Murray t Scottish Natural History Society is taking up the systematic study of the basin the Forth, and they will, I feel sure, give a good account of their labours. O point which must be very strongly emphasized is that a geographical treatise distinguished from a jumble of facts mainly by the order and proportion in whi the phenomena are dealt with, and by the relation of cause and effect that established between them.

As to the utility of complete geographical descriptions, we must of cou recognize their greater practical importance in new and developing countries th in old lands like our own. Yet even with us the study of the distribution natural resources may suggest important changes, involving great redistributio of population.

A Geographical Warning.

Hitherto, except as regards exploration and cartography, the position geography in this country has never been satisfactory. Times are changing, a even in exploration we are now only one amongst many rivals, often bet equipped by education, usually in no way deficient in daring. Although the b work of several of our cartographers in Edinburgh and London need fear comparison, we cannot conceal the fact that Germany leads the world in ma making. As regards the recognition or even the comprehension of geograp by the State, by the universities, and by the public, we are equally far behi our neighbours across the North Sea.

It has sometimes been hinted that the study of geography has been deliberate discouraged by politicians or by merchants because too much knowledge on t part of the public might embarrass foreign policy or lead to mercantile compe tion; but we surely cannot entertain such unworthy suspicions. I am inclin to attribute the neglect of the subject merely to ignorance of its nature due imperfect education.

Two cases in which the application of geography to political and practic affairs suggests a definite course of action may be mentioned as examples. The is still one important colonial boundary entirely undelimited in a region somewh difficult of access and still little known, where goldfields will probably be fou or reported before long, and where a very serious international question ma suddenly arise in a part of the world absolutely unsuspected by most people, eve amongst those who interest themselves in general politics and in colonial affai It would cost a comparative trifle to survey the region in question, and to l down that boundary-line before the goldfields are touched, so that no internation trouble could ever arise. What it may cost to postpone the matter until clain have been pegged out on debatable land, the British Guiana and Venezue arbitration, the Alaska difficulty, and South Africa are there to tell us. It wou be interesting to calculate, now that the cost of a week of fighting is known, t saving in pennies on the income tax that would have accrued from a survey South Africa if that had been carried out as an imperial duty when Cape Colon was settled. I do not for a moment suggest that a survey would have prevent

the war; but it is not unreasonable to believe that it would have shortened it by some months. In this connection it is satisfactory to know that a valuable report has been drawn up by a committee of the British Association, presided over by Sir Thomas Holdich, embodying a scheme for the systematic survey of British protectorates.

The second example comes nearer home. The utilization of wind- and water-power must increase in importance as mineral fuel diminishes in amount or increases in price. Wind- and water-power will never fail as long as the sun shines and the land remains higher than the sea; but what may fail unless timely precautions are taken is the power of utilizing them for the benefit of the community at large. Are the existing laws as to water-rights and the absence of laws as to the utilization of wind desirable and satisfactory? The usual answer to such questions is, "Why trouble about that just now? these matters are not urgent, other things are." That argument is answerable for many disasters. The inevitable is in many if not in most cases simply another name for the unforeseen. It is inevitable that the country will be impoverished if the utilization of wind- and water-power and the transport of that power by electricity are not wisely safeguarded and provided for; but when a survey of our resources, the circulation of the air over our islands, and the effects produced by the interposition of the mountains, plateaus, and valleys upon it, plainly points to the possibility of such a trouble, it only becomes inevitable as a result of culpable negligence.

These two examples, which will not strike any one whose mind is wholly occupied in paying the penalties of old neglect, illustrate my contention that a complete geographical description based on full investigation is of the highest and most urgent importance, not for this country only, but for the Empire, and for every country in the world.

Nor is it the land alone which claims attention. It is of the utmost importance to investigate and evaluate the resources of the surrounding seas. The recent International Conference for the exploration of the sea held at Christiania formulated a scheme of research which has been taken up enthusiastically by Belgium, Holland, Germany, Denmark, Russia, Sweden, and Norway. Its object is to place the fisheries of Northern Europe on a scientific basis, and to make for that purpose a comprehensive survey of the sea, which will prove of high value to meteorology, and through it to agriculture as well. The recent work by Mr. H. N. Dickson on the circulation of the surface waters of the North Atlantic in conjunction with similar work by Prof. Pettersson in Sweden shows how hopeful such researches are from the purely scientific standpoint, and their practical importance is no less. It remains with our Government to show that this country is not indifferent to an opportunity, such as has never presented itself before, of placing one of our great national industries on a basis of scientific knowledge. This is in my belief one of the cases in which the expenditure of thousands now will mean the saving of millions a few years hence.

It is magnificent to send out polar expeditions; they speak volumes for the greatness of the human mind that can give itself to the advancement of knowledge for the sake of knowledge, knowing that it will bring no material gain; and I trust that such a spirit will continue to manifest itself until no spot on Earth, no land however cold or hot, no depth of sea, no farthest limit of the atmosphere, remains unsearched and its lesson unlearnt. But I insist that the full study of our own country is on a totally different footing. Magnificent it may be, too, but sternly practical, since it is absolutely essential for our future well-being, and even for the continuance of the nation as a Power amongst the states of the world. Still, there is every probability that such work will be neglected until the events

which it should avert are upon us, and then it will be too late to make provisions which now could be done cheaply, easily, and effectively.

A Proposed Remedy.

The few attempts which have been made in this country to promote the study of geography or to diminish the discouragements to geographical research have had but slight success. Much has been done to improve geographical teaching by the Royal Geographical Society, the Royal Scottish Geographical Society, the Geographical Association, this Section of the British Association, and other bodies; but that is not my theme. I refer to the little that has been done towards the elaboration of a geographical theory and the elucidation of geographical processes. Amongst the not inconsiderable number of teachers of geography in the universities and colleges of Great Britain there is not one man who receives a salary on which he can live in decent comfort so as to devote all his time, or a substantial part of it, to geographical research; and the same is true of every official of all the geographical societies. Not one is paid a salary sufficient to enable him to devote the time not occupied by mechanical routine to any other purpose than supplementing his income by outside work—writing text-books, correcting examination papers, perhaps even practising journalism. If by an effort and the sacrifice of some of the comforts considered necessary by most people of the professional classes he devotes a few odd hours now and then to some original research, he finds very few to consider it seriously; some friendly expressions of opinion possibly, but scarcely a reader; and it counts for nothing, save, perhaps, in enhancing the reputation of his country in other lands where scientific work, no matter in what department, is valued in a due degree. All this must be changed before much progress can be made. No doubt a giant of genius would ignore all obstacles and pursue his work regardless of recognition; but such giants are not to be looked for many times in a century. It should be made possible for a man of fair abilities to receive as much opportunity, encouragement, recognition and reward for good work in geography as for good work, let us say, in chemistry or electricity. That is all that can reasonably be asked, and that is what is freely accorded in other countries where the status of the man of science is higher than it is with us. It is here that help may be hoped for from the Scottish Universities in the strength of their new endowments. If a Chair of Geography were instituted with the purpose of promoting research first and teaching afterwards, properly equipped with books, maps, and apparatus, and held on the understanding that no outside work was to be undertaken, something might yet be done to restore our country to the position it held a century and a half ago, when a text-book of geography was published without a thought of sarcasm, containing a frontispiece representing "Britannia instructing Europe, Asia, Africa, and America in the Science of Geography."

GEOGRAPHICAL CONDITIONS AFFECTING BRITISH TRADE.*

By GEORGE G. CHISHOLM, M.A., B.Sc.

I HAVE often been led to think that foreigners who endeavour to arrive at a knowledge of English ideas from a perusal of our periodical literature, must be greatly struck by what seems to be the Englishman's delight in self-depreciation. This spirit would appear to be conspicuously manifest in connection with British

* Paper read at the Glasgow Meeting of the British Association, September, 1901.

trade. Leader-writers, contributors to magazines, British consuls, popular authors of jeremiads and ichabodiads write on this subject, if not with unanimity, at least, for the most part, with a harmony that must be, and in fact is, very comforting to our competitors, but far from cheering to the representatives of British trade and industry. So much does the spirit to which I refer prevail, and so completely does it carry with it to the British public its own evidence, that it absolves those who are properly animated with it from the necessity of any laborious inquiry into facts. Like all luminous ideas, it gives to the possessor a preternatural power of insight, which enables him to penetrate with swift incisiveness to the true cause of phenomena which might otherwise be hard to explain. If figures show that in a particular period, or even in a particular year, British trade with some part of the world has been declining, or even has not been advancing so rapidly as that of some other country, that is promptly accounted for. Somehow or other it must be due to our own negligence. "At present our supremacy [in trade] . . . is seriously threatened. . . . Without inquiring too closely how far this relative inferiority [in rate of expansion] is due to the diminished efficiency of our workmen, or the want of initiative and enterprise on the part of the masters and their staff, we may take it as self-evident that we are bound to neglect no means of improving, to the utmost, our processes of production and our machinery of distribution." * The words I have just quoted are from a leading organ of public opinion, and I think they will be readily recognized as a typical comment on the apparent tendencies of English trade.

But in this current of opinion I am not able to join, and the reason is that, however much British trade may be affected by the backwardness or enlightened enterprise, slackness or energy of those concerned in British commerce and manufactures, there are also important geographical conditions to be taken into account. And with regard to these I find myself in the same unfortunate position as I have been in before in addressing a meeting of the British Association—that of having nothing to say but what is obvious, and my only excuse is that, however obvious and large the facts may be, people won't look at them.

Of the influence of geographical conditions on trade and industry, we could have no better illustration than in the history of the great city in which we are now met. Throughout the period in which Scotland had a separate history from that of England, Glasgow was notoriously a quite unimportant town. Its population was ascertained in 1708, the year after the union of the English and Scottish parliaments, and was then found to be under 13,000. At the present time, disregarding municipal boundaries, with which geographers have little or nothing to do except to express a natural irritation at the way in which they are misled by them, and taking in the contiguous places which form along with the so-called Glasgow one industrial and commercial aggregate, we find that the total population exceeds 900,000; and Glasgow is known all over the world as one of the greatest industrial and commercial centres of the globe. Now, is there any one who would ascribe this difference solely to the superior enterprise and ability of the people of Glasgow at the present time as compared with those of past centuries? The true cause of this difference is, in fact, well understood. The geographical and economic situation of the Glasgow of the past cannot be more comprehensively and compactly described than in the words of one of your own citizens. "The city was planted on the western limits of civilization. . . . It was remote from the great lines of mediæval intercourse from which the commercial grandeur of Venice, Antwerp, and other wealthy cities had been acquired. It was a poor little town,

* *Standard*, January 18, 1901.

planted in a very poor and thinly peopled country, within reach of a small river which, flowing towards a highland region peopled by wild and lawless races, fell into a trackless and unexplored ocean. Thus, with indifferently fertile land, with a variable and rigorous climate, with no natural wealth nor valuable products calculated at that time to excite the cupidity of commercial communities, . . . individual enterprise and commercial expansion were not to be looked for." *

A change took place at the union of the English and Scottish parliaments. The Scotch everywhere grumbled, lamented, and profited, just as the English might have done in similar circumstances. By this time the trackless western ocean was explored. Markets had begun to grow up on the other side of it. These markets were largely in English hands, but the union opened them also to the Scotch, and of this Glasgow promptly took advantage. Now here, in order to explain the comparatively rapid rise that then took place in the fortunes of Glasgow, we have to notice one geographical fact of great importance. It is that the physical configuration and outline of Scotland give to Glasgow, as its hinderland in relation to this western or transoceanic trade, not merely the small and "indifferently fertile" basin of the Clyde, but the whole of the eastern lowlands of Scotland from the Grampians to the Cheviots, which under former conditions were infinitely more favoured by nature than the western side of the country. Glasgow had long seen the desirability of improving the Clyde navigation. It was concerned with other towns on the Clyde in making efforts in that direction as far back as the middle of the sixteenth century; but these first and other subsequent efforts in the following century were futile. Not till after events had brought the great hinderland just mentioned in relation to profitable markets in the west was it really remunerative to carry out the great and almost uninterrupted series of improvements which justify your local saying, "Glasgow made the Clyde—the Clyde made Glasgow." Not till the latter part of the eighteenth century could Glasgow be reached by boats of more than five tons. It hardly needs to be pointed out how enormously the local advantages of Glasgow have been increased by the great invention of one of your own citizens, which gave a totally new value to the deposits of coal and excellent iron ore in the immediate neighbourhood of your city.

Glasgow, however, I take merely as an illustration of my main thesis, the importance of attending to geographical considerations. It is now time to turn our attention to the special subject of the present paper, the geographical conditions affecting the commerce of the United Kingdom. For the purpose of our present investigation it will be well to distinguish between conditions affecting commerce and those affecting industry, even though these are inter-related, and act and react on one another.

The advantages of the United Kingdom for a widespread commerce are universally recognized, but it is important to note at the outset that the merely commercial advantages of this country exist solely in relation to those parts of the world that are most easily reached from the seaboard. That, of course, is saying a great deal, and the importance of this consideration is seen to be all the greater when we consider the facts a little more narrowly. It cannot, indeed, be contended that this country has any special advantages arising from its situation in relation to commerce with the East. Italy, which for a long period in the past successfully turned to account its special advantages in relation to this commerce, may perhaps some time in the future come to benefit once more in a marked degree in the same way. England, however, has undoubtedly special advantages of situation in

* 'Glasgow: Its Municipal Organization and Administration,' by Sir James Bell, Bart., and James Paton (1896), p. 4.

relation to commerce with Europe and America, and when we consider the climatic and other conditions likely to affect the development of industry in these parts of the world in the future, so far as we now have the means of making any forecast, it may, I think, be contended that the merely commercial advantages of England are unparalleled, and are likely to remain without a parallel, in any other part of the globe of equal extent.

The extent of this advantage is, it seems to me, strikingly illustrated by the great magnitude and remarkable constancy of the *entrepôt* trade of the United Kingdom, that is, the trade in commodities collected from all parts of the world, and afterwards dispersed unchanged over other parts of the world. Taking the average of five years, we find that the value of foreign and colonial merchandise, exclusive of transhipments, exported from the United Kingdom has been uniformly about one-fifth of the total value of the exports from the period 1866–70 down to the latest period 1896–1900. It has not, in any of these successive periods, been two per cent. either above or below the proportion stated, notwithstanding all the fluctuations that the total commerce of the country has meanwhile undergone. This is all the more striking when we consider that there have been great variations in the mode in which the total *entrepôt* trade is made up. In the beginning of the period now considered, cotton was the most important item in this trade; for a long time cotton has been displaced by wool. Raw silk was at one time an important item; it has now sunk to absolute insignificance. Rubber was formerly unimportant; it is now steadily rising to a more prominent place in the list. The important point to note in the present connection, however, is, not the details, but the fact that so far losses under this head in one direction have been made good by gains in another.

Now, such a trade as this necessarily involves and therefore illustrates advantages of commercial situation, but it would be a gross and obvious mistake to put it down solely to such advantages. This trade is pre-eminently an illustration of the law that to him that hath shall be given. It is in a large measure due to the special advantages which this country enjoys for carrying on a large export and a much larger import trade based on its own resources.

Perhaps an even more striking illustration of the merely commercial advantages of this country is to be found in the history of the cotton trade. It cannot be contended that the industrial advantages promoting the cotton manufacture in this country are as great as those in favour of the woollen industry. We have no home supply of raw cotton, but we have a large local supply of raw wool of special value for certain purposes, which not only furnishes material for a great part of our manufacturing industry, but leaves a surplus for export larger then the estimated amount exported when English wool was of such high value in the middle ages. Yet the English woollen industry never attained that extraordinary pre-eminence which was very speedily acquired by that of cotton after the introduction of steam-driven textile machinery, and which it still retains. According to the latest statistics, all branches of the woollen industry in the United Kingdom, namely, woollen in the special sense, worsted, and shoddy, occupied not much more than half as many persons as the cotton industry,* which now engages more employees than any other industry in the country except agriculture and coal-mining. But there is one great commercial difference between the two industries. The great markets for woollens are the most highly developed industrial countries. The markets for cottons are everywhere; some of the most important in tropical and

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* In 1896, number of persons engaged in the cotton industry, 532,920; in the three branches of the woollen industry, 284,441.

sub-tropical countries industrially backward. From any one producing co
the bulk of these markets must be reached from the seaboard, and hence in re
to this trade England has had from its origin a very important commercial advai

Now, if the general thesis may be accepted that the United Kingdom has
eminent commercial advantages with respect to markets approached fron
seaboard, there are a few corollaries which should be borne in mind. It fo
that the improvements in ocean navigation tend in the aggregate more t
commercial advantage of this country than any other. Some of these imp
ments have tended peculiarly to the advantage of this country. Among
may be mentioned the change from wood to iron and steel as ship-bui
materials, and still more the change from wind to steam as a means of propu
The possession of the field of the best steam-coal in the world, in a positi
convenient as that in which it lies in South Wales, is an enormous benefit t
country. There are other improvements the advantage of which is more gen
the enlargement of ships, the various improvements in marine engines to
your city has so largely contributed, the enlargement and improvement of har
all over the globe, and the improvements in the means of communication be
the seaboard and the interior. All these improvements tend more or less
advantage of all maritime countries, even to that of some that are not mar
Some individual improvements tend more to the advantage of other indiv
countries than England; but, on the whole, the United Kingdom is more ber
by such changes than any other single country.

If an improvement in the means of communication between the seaboar
the interior is to be looked upon as a circumstance specially favourable to E
trade, still more favourable must be any important extension of the seaboard
the interior. Now, this is practically what is getting tested at present i
region of the great lakes of North America. If it turns out that ocean ship
really be economically used on the improved canals of the St. Lawrence (in
there is now a minimum depth of 14 feet), that means that a great additi
made to the seaboard (though not, it must be remembered, an easily acce
seaboard) in one of the most important commercial regions of the globe. S
a true insight into the situation is shown, at least in one respect, by the o
a British syndicate to the Canadian route to open up this seaboard by the
struction along a still shorter route of the long-talked-of Montreal, Ottawa
Georgian Bay canal. If constructed in adequate dimensions the canal migl
pay the syndicate, but it could hardly fail to benefit British commerce.

But in spite of what has been said as to the increasing commercial advai
of the position of England, I don't think it could be contended that all the
siderations above adduced would serve to account for the astounding pre-emi
which the United Kingdom enjoys in the ocean carrying trade of the world.
must also take into account what has already been said in connection w
entrepôt trade. The country that has most to carry across the ocean for it
likely on that account to carry all the more for other countries also.

It cannot be denied, however, that there are some developments of recent
that have tended to diminish the proportion of the ocean traffic of the world b
ing to this country. The tendency is for more and more of that traffic to be
by regular liners, and when the traffic of a port, direct or indirect, with any
the world comes to be large enough to make a line remunerative, the establis
of such a line in connection with any foreign port is certain to affect the I
carrying trade adversely and rather suddenly. Such was the case, for exam
consequence of the establishment of the Messageries Maritimes line to Austr
1883, and those from Bremen and Hamburg respectively in 1887 and 1888.

when one considers the admirable communications of such ports as Hamburg, Bremen, Rotterdam, Antwerp, and Marseilles with the interior of Europe, one cannot but feel a little surprise that they have been so slow in encroaching on the domains of British commerce. Possibly this encroachment would have been much more rapid if it had been practicable for European countries to throw down some of the fiscal barriers which commerce must leap there.

But if Great Britain has on the whole decided advantages for commerce by sea, it has no such advantages for any extensive commerce by land. Quite the reverse. Any improvement, therefore, in the means of communication between any foreign inland centre of production competing with British centres of production and an inland market is something that tells directly against British commerce. This I propose to illustrate by reference to the commerce of Germany with surrounding parts of Europe, and that of the United States with Mexico and Canada.

Of all the larger countries of the world, Germany is that which has the best position for carrying on a large external trade by land. It lies in the heart of the most populous and the wealthiest part of the mainland of Europe, in communication with more than one of them by admirable inland waterways, and by rail without break of gauge, with all countries on its land frontiers except Russia,* and also through Switzerland and Austria with the rich plains of northern Italy. One of the most instructive illustrations of this advantage is given in an English Foreign Office report. The author of this report, Mr. Mulvany, H.B.M.'s consul at Düsseldorf, mentions that before the Franco-German war the Paris gasworks obtained their coal from his district, and that after the war the trade was promptly revived, and points out that there is, of course, an "immense advantage in being able to send the coal direct into the consumer's yard in the trucks loaded at the colliery screens." † When one remembers the amount of international bitterness to which that war gave rise, one perceives all the more clearly how great the advantage must have been in that commerce.

In the third edition of my 'Commercial Geography' I have already mentioned a fact that illustrates, as it seems to me, very plainly the effect of the establishment of one of the means of communication across the Alps just referred to. In 1880 60 per cent. of the total imports into Italy of iron bars, rods, etc., of a thickness of one-fifth of an inch or upwards (the largest head of iron and steel imports generally) was from the United Kingdom, only 2 per cent. from Germany; in 1890 less than 22 per cent. was from the United Kingdom, more than 52 per cent. from Germany. Now, the Italian statistics enable us to distinguish the imports (and exports) by sea from those by land, and hence we learn that more than nine-tenths of the German total came by land, whereas all the English import was by sea. That means that the great bulk of the German import came through the St. Gothard tunnel, which forms a very direct communication between Italy and the great iron and steel working districts of the Rhine basin. But in 1880 there was no St. Gothard tunnel, and that fact would seem quite sufficiently to account for the difference. If so, we have here a case of loss of English trade entirely due to a geographical cause, and not involving the supposition of "diminished efficiency" on the part of our workmen, or "the want of initiative and enterprise" on the part of English masters and their staff. And later figures on this point are also instructive. Taking those for 1897 (the latest that happened to be available at the time), I found that practically the same percentage of

* Russia has a 5-feet gauge; the other countries have the normal English gauge of 4 feet 8½ inches.

† Foreign Office Report, Miscellaneous Series, No. 454, p. 8.

the same class of goods was imported from Germany as in 1890, but British percentage had grown from 22 to 34·6. Apparently Germany ha full advantage of the St. Gothard tunnel by 1890, and was not able to e further in the direction indicated on British trade.

And it must not be assumed that all imports from the United Kingd Italy come by sea. In the case of some goods that mode of carriage does r The bulk of English cotton yarns, for example, that reach Italy enter that by land. In such trade, therefore, England is obviously at an even disadvantage commercially, as compared with continental centres of proc How important for German commerce with Italy the land connections a be guessed from the fact that, while in 1899 the quantity of goods export Germany to Italy was 242,095 metric tons, the total tonnage of ships with cargo from German ports in the same year to Italy and Malta was only I say "guessed," for we cannot tell what quantity of goods may have be from Germany to Italy in that same year by sea from foreign ports (Rotte Antwerp).

Let us turn now to similar relations between the United States and its bours on the land frontiers. There was no railway connection between Mex the United States till 1884, in which year the Central Railway was open necting the city of Mexico with the United States railway system at El Pas the middle of the frontier. There are now three other railway connections b the two countries, two of them connecting the city of Mexico with the States at other points, and one connecting the Southern Pacific railway w Mexican port of Guaymas. The effect on the destination of the export Mexico was apparently very speedy and very marked. Here at least figures :—

VALUE OF EXPORTS FROM MEXICO IN THOUSANDS OF POUNDS.

	1883-4.	1884-5.	1888-9.	189
To United States ...	4546	5385	8510	11,0
„ United Kingdom ...	4026	3201	2611	9

These results are by no means surprising when we consider that the grea of the exports from Mexico consists of silver ore, silver, and partially refined all commodities easily capable of standing the cost of long railway transit, great deal going to the smelting and refining centres of Colorado, with whi first railway to the United States established a very direct connection.

The import figures are also interesting, though, I believe, there are no retu this head so early as 1884–5.

VALUE OF IMPORTS INTO MEXICO IN THOUSANDS OF POUNDS.

	1888-9.	1899.
From United States	4722	5509
„ United Kingdom	1320	2072

Under this head, it will be observed, the United Kingdom holds its own better than under that of exports. The imports, chiefly manufactured goo largely of a kind that come from the eastern parts of the United States

that naturally make use of ocean carriage. On the whole, however, the competition between the two countries in Mexico is one between land and sea transport, and as the people of the United States find their interest in improving the railway connections between their interiors, so the English find their interest, in accordance with what has been already said in general terms, in the improvement of the ports of Vera Cruz and Tampico, and of the connections between these ports and the interior.

Canada, with its enormous land-frontier bringing into connection at many points some of the more populous parts of the Dominion and its neighbour, not, as in Mexico, through a uniformly sparsely peopled region, is in some respects an even more striking illustration of the importance of land connections than Mexico. These connections are constantly becoming more intimate, with unmistakable effects on the commercial relations of Canada with the United States and the United Kingdom respectively, though, from the difference of the circumstances, these effects are of a somewhat different nature. Canada has some exports of a similar nature to the leading exports of Mexico, and these go largely, if not chiefly, to the United States for the same reasons as those of Mexico. Under this head may be included nickel matte as well as silver and gold ores. But these do not form the bulk of Canadian exports. Most of the exports from Canada are similar to those which are produced in abundance, if not in excess, by the contiguous parts of the United States, and such as have a special value are to a large extent kept out of the United States by heavy fiscal duties. Hence the Canadian exports go in increasing proportion to Europe, principally to the mother country. But it is otherwise with Canadian imports. These are largely of a kind in which the United States and the United Kingdom compete with one another, and the United States have obvious local advantages in the competition.

First, it must be remembered that English goods are landed at furthest at Montreal, and that only during the summer months. Now, more than half the population of Canada is found to the west of Montreal. However cheap, therefore, carriage in bulk by sea may be, there is an addition to the cost of transport arising out of the break of bulk and a longer or shorter railway journey over and above. In the case of Toronto, the great distributing centre for Ontario, the length of the railway journey is 338 miles. Now, Toronto is within a much shorter distance of several producing centres in the United States without break of bulk. And if this is an important consideration with respect to the central and some parts of the eastern districts of Canada, it is obviously of still greater importance in the case of the western provinces in relation to such producing or jobbing centres in the United States as Chicago and St. Paul.

That, moreover, is by no means the only way in which the United States competition is favoured by the intimacy of the railway connections with Canada. It is hardly needful to remind you of the important part played by commercial travellers in promoting trade. There is nothing that our consuls so frequently remind us of, and it is often pointed out that commercial travellers from the United States are much more numerous in Canada than those from England. Very true, no doubt; but how can it be otherwise? However much transport may have been cheapened, man still remains an expensive commodity to carry, especially when you take into account the loss of interest on capital during the period of transit, that is, the loss of the traveller's time. Now, I do not suppose that the numerous commercial travellers in Canada, representing firms of the United States, come from New Orleans, San Diego, and such outlying parts. A good many of them, no doubt, come from Detroit and Buffalo, where the travellers have only to cross the border to get into Canada. One can imagine a commercial traveller

saying to his wife in the morning, "I shall not be back to dinner to-day; I am going to London," meaning London, Ont., or a Buffalo traveller making the same explanation with regard to Hamilton. Montreal is not so far from New York as Glasgow or Edinburgh is from London, and can be reached in a short night journey. London, Ont., is only 114 miles, or 4½ hours from Detroit, and Toronto 229 miles, or 7¾ hours. Hamilton is only about 70, and Toronto little more than 100 miles from Buffalo.

Obviously, too, contiguity favours trade between the United States and Canada in perishable commodities, such as either cannot be conveyed at all between Canada and Europe, or only at extra cost.

Further, imports from the United States into Canada are favoured by another geographical condition, which does not necessarily result from contiguity, but is due to the fact that these two countries, or at least the adjacent portions of them, have a similar climate, and have grown up under similar economic conditions. Agricultural settlement is rapidly taking place in both, and the cultivated areas are similar in surface features, in climate, and in economic requirements. The same kind of agricultural machinery is used in both, and more largely used in the United States than anywhere else in the world. Now, production can always be carried on more cheaply on a large scale than a small one, and hence it is natural, one might say inevitable, that the United States should manufacture this machinery for Canada.

The similarity of the winter climate causes the use of the same means of guarding against it in both countries. The method of domestic heating suitable enough for the mild and uncertain winters in England, is altogether unsuited for the regular and severe winters of Canada and the United States. In both these countries the same kind of stoves and the same kind of fuel are used domestically. Large manufactures of such stoves are carried on at Detroit, and without the slightest doubt the manufacturers of these stoves find an immense market in the adjacent parts of Canada as well as in the adjacent parts of the country to which they belong.

With all these conditions favouring the commerce of the United States, it is not, therefore, to be wondered at that the percentage value of the imports of the Dominion of Canada from the United Kingdom, reckoned on the total value of the imports, has declined from about 51 in the year 1867–8 to about 24 in 1898–9, while that of the imports from the United States has gone up in the same period from about 36½ to 62½; and that these movements have scarcely been arrested by the recent preferential tariff in favour of the products of the United Kingdom. This last circumstance is indeed the less surprising when we consider that the Canadian free list includes anthracite (the Pennsylvanian fuel required for domestic purposes), coke, various kinds of timber, hides, cotton, wool, and other important commodities, to which the favouring conditions indicated above apply in their full force.

We must now proceed to consider the industrial position of the United Kingdom and her rivals. The industrial pre-eminence of England may be said to have been first attained in the early part of the eighteenth century. It was then largely based on the possession by England of a great abundance of excellent wool, combined with the advantages of her commercial situation. Her industrial advantages were, of course, enormously enhanced by the inventions which, towards the close of the eighteenth century, gave an entirely new value to her extraordinary wealth in coal and iron ore in remarkably convenient situations. Directly or indirectly, these inventions have led to an increase in the production of coal in the United Kingdom from an estimated total of about 10,000,000 tons in 1800 to one of 225,000,000 tons in 1900.

If England had been the only country possessing these advantages, then the relative position of this country in manufacturing industry might perhaps have been maintained for an indefinite period, and even increased; but it does not follow that this country would have been so rich as it now is. But of course this country is not the sole possessor of such wealth, and although, owing to historical circumstances, this country was the first to turn such wealth to account, other countries possessing it were sure to do so in time, and it was mathematically certain that as they did so the relative position of England would be lowered. England may have still, probably indeed has, greater industrial advantages than any other area in the globe of equal exent, but they are not greater in the same degree as they once were.

This is so obvious that it does not need to be enforced in general terms; still, a few details are worthy of attention. One country on the mainland of Europe, far advanced in its general economic development, is well known to be very rich in coal, and that coal also is, to a large extent, very conveniently situated. The country to which I refer is, of course, Germany. One of the two largest coalfields of this country, that of the Ruhr basin, is contiguous to the Rhine, and is throughout its length of 60 miles in water-communication with that river, a river whose valley has been a highway of commerce from north to south in that part of Europe, and hence a means of attracting and condensing population, from prehistoric times downwards. The coalfield has many easily worked seams. Within 150 or 160 miles of that coalfield are two of the most important groups of iron-ore deposits on the mainland of Europe. One of these groups lies about 70 to 90 miles south-east of the Ruhr basin, in the hilly country where the Prussian provinces of the Rhine, Westphalia, and Hesse-Nassau meet. This group produces ore of three or four times the value of the ores of the other group, which is situated partly in and partly on the borders of the grand-duchy of Luxemburg (part of the German Customs Union, it will be remembered), at the distance of 150 to 160 miles from the coalfield. The ores of this group, though less valuable, are much more easily worked, and hence form about two-thirds of the quantity of the total iron-ore production of the German Customs Union.

Now, in these circumstances it is surely not to be wondered at that the coal and iron fields mentioned should come to be opened up, and that there should follow a considerable development of the various industries that have been fostered by the wealth of coal and iron. Indeed, when all the facts are considered, what does seem to demand explanation is, not that Germany should have come to be a competitor with this country, but that she should have been so long about it. It does seem surprising that the first coke blast-furnace in the Ruhr basin should have been blown in only early in the forties of last century, that the first railway of this region, from Cologne to Minden, should have been opened only in 1846; that as late as 1860 the total production of coal within the territory of the present German Empire (which has several other well-placed coalfields) should have been under 12½ million tons. Since 1860, however, the production has increased apace, and with it have grown all kinds of industries. Our own country has thus inevitably been placed in a lower relative position industrially, but surely the facts just stated are enough to indicate that this does not necessarily imply either "diminished efficiency of our workmen or the want of initiative and enterprise on the part of the masters and their staff." That, in fact, it is not always so, that in some branches of industry we still enjoy a confessed superiority, is sometimes made plain enough by the testimony of our rivals. A writer in a Leipzig periodical connected with the textile industry complains that the finer and very fine cotton yarns "have remained insufficiently protected against the overpowering competition

of Great Britain and Switzerland, with the result that the spinning of fine yarns has not progressed, and is only able to develop slowly and at a sacrifice." He goes on to point out that "the German cotton-spinning industry is unfortunately obliged to import almost the whole of its machinery from the United Kingdom," and adds that it does not redound to the credit of German engineers that, since the establishment of the German Empire, practically nothing has been done to render the German spinning mills independent of the British machinery builders. "The reproach that the German finer yarn spinning industry has not progressed to the extent expected by consumers of these yarns may be laid at the door of these latter themselves, and demonstrates their ignorance of the unfortunate history of this branch of the cotton industry. The finer yarn spinning industry has been continually disturbed. In 1878 it was granted a moderate duty; early in the eighties the question of customs drawbacks was brought forward; then, in 1893, the protective duty was reduced in the way of treaties; and likewise since that time the industry has not been left in peace—agitated from all sides and defended by none. Could it, under such conditions, be seriously expected to progress?"

In all this there is nothing to the discredit of British industry, but very much the reverse; but perhaps after all the most interesting thing in this quotation is the illustration it affords of the keen business-like sense, not without parallels in our own country, of the injury done to trade by the selfishness of other people.

On the other side of the Atlantic there has, meantime, been growing up another keen competitor, which it is utterly absurd to suppose that this country can permanently rival in the magnitude of its foreign commerce. The difference in magnitude and the extent of the natural resources will in time make the comparison altogether out of the question. These resources include fields of coal, and probably also of iron, of greater extent not merely than those of the British Isles, but those of all the countries of Europe together. And in this case there is no reason to speak of any tardiness in their development. They have been opened up and worked with as much rapidity and energy as there was any reason to anticipate. It is true that none of the coalfields of the United States are so conveniently situated with respect to the seaboard as those of Great Britain; but, as above indicated, this fact places them and the industries dependent on them at no disadvantage, as compared with competing industries of the United Kingdom, in relation to the great bulk of the local markets. These markets are for the most part inland, not so easily reached from the seaboard as from inland centres of production.

Thus, then, a vast change is brought about in the relative industrial position of the United States not ascribable to any negligence on the part of British manufacturers or merchants.

Then there is another point to consider. Our mines have been longer worked than those of any other country, except perhaps Belgium. An inevitable consequence is that the seams most easily reached and worked are to a large extent worked out. We are compelled to work our thinner seams, or to reach thicker seams by deeper shafts and more extensive tunnelling. On the other hand, the American mines are still worked for the most part only to a comparatively small depth, in many cases by means of level-workings opening on hillsides (as in the case of a few of our Welsh mines). Coal, too, has been cheapened in America, in many cases by increasing demand favouring the economies due to working mines on a large instead of a small scale, as well as by a large amount of immigration of miners from parts of Europe in which a lower standard of living prevails. In these ways the average price of coal in America, and especially in certain parts of America, has been on the whole gradually lowered, while that in

our own country, and in other European countries, has remained fairly stationary or risen. This is shown by the following table, in which, besides averages for entire countries as given in the Coal Tables annually issued as a parliamentary paper, I have also inserted, in order to give more definiteness to the comparison, for some years the averages of certain states of the United States and certain districts of Great Britain and Germany:—

AVERAGE PRICE OF COAL PER TON AT THE MINES.

Year.	United Kingdom.	United States.	German Empire.*	West Glamorgan-shire.	Penn-sylvania. Anthracite.	East and West Riding, Yorkshire.	North and East Lanca-shire.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1883 ...	5 7½	6 5½	5 4	—	—	—	—
1884 ...	5 4¾	5 7¼	5 3¾	—	—	—	—
1885 ...	5 2	6 8¼	5 3¼	—	—	—	—
1886 ...	4 10	6 4¾	5 3¼	—	—	—	—
1887 ...	4 9¾	6 6¾	5 2¾	5 4	8 3½	4 9	5 3
1888 ...	5 0¾	6 0	5 3½	5 10	9 1	5 1½	5 6
1889 ...	6 4¼	5 3½	5 9½	8 3	6 8½	6 3	6 8
1890 ...	8 3	5 2¾	5 9½	10 9	7 4½	8 9	8 1
1891 ...	8 0	5 3½	8 1½	10 10	6 9	8 3	8 3
1892 ...	7 3¼	5 4¾	7 6	9 3	8 0	7 9	7 6½
1893 ...	6 9½	5 4	6 10	7 9	8 0¾	7 2	7 10
1894 ...	6 8	5 1	6 8½	7 9	7 2¾	7 4	7 4½
1895 ...	6 0½	4 9¼	6 11	7 4	7 2¼	6 5	6 7½
1896 ...	5 10¼	4 9¼	7 0	6 10	—	6 5	6 3¼
1897 ...	5 11	4 7½	7 3	6 9	—	6 7	6 3½
1898 ...	6 4¼	4 5	7 6	6 10	7 2½	7 0	6 4¾
1899 ...	7 7	4 8½	7 11	7 8	7 11¾	7 8	7 6¾
1900 ...	10 9¾	5 5½	9 0	—	—	—	—

Year.	Northum-berland.	Pennsyl-vania. Bituminous.	Illinois.	Alabama.	Dortmund. Steam and coking coal.*	Dortmund. Puddling and good steam coal.*	Upper Silesian gas coal.*
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1887 ...	4 7	4 2½	—	6 0¾	5 8	4 6	6 0
1888 ...	4 4	4 5	5 3	5 5	6 1½	5 7	6 0
1889 ...	5 5	3 7	4 6½	5 2	8 7½	7 6½	7 1½
1890 ...	7 7¾	3 9	4 6	5 2	10 11	10 0	9 8
1891 ...	7 4	4 0¾	4 3	5 0	10 0	8 1½	9 4
1892 ...	6 6½	3 7½	4 8½	4 8	8 7½	7 5	9 3
1893 ...	5 11½	3 1¾	4 5¼	4 5¼	7 5½	6 7	9 2
1894 ...	6 7	3 3¼	4 2½	4 2¼	8 1½	7 0	9 2
1895 ...	5 6¾	3 3¾	4 3½	4 2½	8 1½	7 6½	9 2
1896 ...	5 0¾	—	—	—	8 4½	8 0	9 1
1897 ...	5 3	—	—	—	—	—	—
1898 ...	6 1¼	2 9½	3 7½	3 11½	—	—	—
1899 ...	7 0¾	3 8	3 7½	4 8	—	—	—

The very considerable fall in the price of Alabama coal must have afforded a

* In these columns the values given are not in the original sources, but are altered so as to correspond to a ton of 2240 lbs. instead of the metric ton of 2205 lbs.

great stimulus to the development of the iron and steel industry in that state, where coal, excellent iron ore, and limestone are all found close together at the southern end of the Appalachian system. It is from that district that most of the iron and steel recently exported from the United States to various European countries, including the United Kingdom, is derived.

The northern iron and steel working centres have not the advantage of obtaining coal and iron ore near one another; but that is compensated by the fact that these centres can be supplied with any amount of excellent iron ore well adapted for steel-making by the Bessemer and open-hearth processes from deposits worked with extraordinary facility in various hill ranges, the Marquette, Menominee, Gogebic, Mesabi, and others, round the head of Lake Superior, in the states of Michigan, Wisconsin, and Minnesota. Some of these deposits were discovered quite recently, those of the Gogebic range in 1884, those of the Mesabi range in 1892. The production of the Gogebic range rose from about 1000 tons in 1884 to upwards of 1,285,000 tons in 1887. Such discoveries must obviously have exerted a great and rapid influence on the development of the iron and steel of the States. The ore is quarried in the open air, and, after a short haul to a lake-port, is transported with extraordinary cheapness in whaleback steamers to Chicago, Lorain, Cleveland, Ashtabula, Conneaut, or some other lake-port, in some of which iron and steel works already exist, though the bulk of it is carried further on to older iron-working centres in the interior. All these ranges round the head of Lake Superior now yield considerably more than two-thirds of the total production of iron ore in the States.

And these are not all the natural advantages of the States with respect to this one industry. Fuel is available not only in the form of coking coal, but also in those of petroleum and natural gas, both in great abundance. Moreover, the market of the States is unique in the world as regards extent and value combined. There is no other population in anything like the same economic condition offering so large a market absolutely unimpeded by fiscal barriers. This last condition favours in a peculiar degree that colossal production centralized in a few places for which the States are remarkable, and this circumstance again favours the maintenance of remarkably low railway rates for the carriage of large quantities of goods long distances between certain points.

With all these advantages, one would hardly have imagined that fiscal barriers around this great market would have been necessary to prevent competition within it; and it is at least not surprising that the United States has surpassed this country in the production of pig iron and steel since 1890.*

The distance from the seaboard of both the coal and iron of the United States has hindered that country so far from becoming a serious competitor with the United Kingdom outside of America except in the case of the more expensive finished products, such as machinery. But there are other parts of North America more favoured. Canada has coal on the seaboard both in the east and west; and with the coal and limestone deposits of Sydney, Cape Breton, and the iron ores of Belle Island, Newfoundland, blast furnaces have now been started at the former place with the view of producing iron and steel for sale on both sides of the Atlantic.

A still greater alteration in the relative industrial advantages of Great Britain may be brought about by the increasing application of water-power. Formerly the benefits to be derived from this source of power were restricted by the fact that it could be used only at the place where it existed, and in such circumstances it was

* The years 1894 and 1896 excepted in the case of pig iron.

in many cases not practicable to use it at all; but now the employment of electricity as a means of transmitting this source of power to places in which it can be conveniently made use of is rendering it much more freely available, both for the working of stationary and locomotive engines, and also for the development of heat.

Now, it is notorious that this course of development must turn out much more to the advantage of the industries of some other countries—Switzerland, Italy, Norway, Canada, the United States—than our own; but there is all the less need for any enlarging on this topic since it was only a few weeks ago dwelt on at some length by the President of the Society of Chemical Industry at its annual meeting in this city. I will only direct a little attention to the electrical employment of water-power in Italy, where, it seems to me, there is a point of special geographical interest in connection with this enterprise.

Italy has a peculiarly honourable place in the history both of electrical science and its practical applications. The very name bears witness to the fact that Italy was the birthplace of Voltaic electricity. To an Italian physicist, Pacinotti, was due the first idea of a dynamo-electric machine (invented in 1860, and first described in the *Nuovo Cimento* in 1867). It was in Italy, at Milan, that the first central station for electric lighting was established on the mainland of Europe (1883). It is to Italians that we owe the recent development of wireless telegraphy. Now Italy, as is well known, has been dealt with by nature in a rather niggardly fashion in the matter of coal. On the other hand, it is rich in water-power. The amount of such force already utilized is as much as 300,000 horse-power, and the amount not as yet utilized, but capable of being conveniently turned to account, is estimated from official sources at 2,800,000 horse-power in round numbers, a total accordingly exceeding three millions of horse-power, calculated, if used day and night, to represent, at the prices of coal in Italy in 1900, an annual value of about 800 millions of lire (say £30,000,000).*

Water-power is already utilized electrically in Italy, not merely for the purpose of lighting and locomotion, but also for the production of hydrogen and oxygen by the electrolysis of water and the manufacture of carbide of calcium, and works are in progress for utilizing the same power in the same way for the refining of copper (at Leghorn), the smelting of iron ore (at Darfo on Lake Iseo), and the manufacture of caustic soda (on the Pescara). An enormous stimulus was naturally given to the application of Italian water-power by the discovery of the processes by means of which it may be transmitted to great distances. To enable Italy entirely to dispense with the use of English coal, it would be necessary for the force developed in the mountains by falling water to be conveyed distances of from 100 to 125 miles. With the use of high tension electricity the transmission of power for even a greater distance has been found practicable elsewhere; and steps are now being taken, if they have not already been carried out, for the transmission of 11,000 horse-power from the torrent of Cellina to Venice, a distance of 56 miles, at a tension of 25,000 volts.

Italy is now looking forward to a great industrial development through the application of her inexhaustible water-power, and the point of special geographical interest to which I would call attention in connection with that is this. Italy occupies, in some respects, a peculiarly advantageous geographical position. That

* These and other particulars relating to the use of water-power in Italy are taken from a paper by Giuseppe Colombo in the *Atti della R. Accademia dei Lincei*, Anno cexcvii. (1900), pp. 478–489.

was made abundantly manifest throughout the history of the middle ages. Though the advantages of that situation were, to a large extent, lost through the discovery of the sea-way to India, they have been in some degree restored by the cutting of the Suez Canal. Nevertheless, these advantages have not yet been greatly turned to account since that date. We must remember, however, the great law of commerce to which I have already referred, "to him that hath shall be given." If Italy, through the development of a great manufacturing industry by means of her water-power, is able to build up a great external commerce based on her own resources, all the more likely is she to add to that trade a great *entrepôt* trade, possibly, and indeed probably, to the prejudice of our own. One thing wanting for this is a great port in a suitable situation. Venice is not adapted to modern conditions. It is too cramped for further growth. But I have often thought that if local conditions allowed of the creation of a great port at Rimini, there might there grow up a new Venice, which might come to outrival in wealth and in commerce, though never in glory, the Venice of the past.

In conclusion, I will venture on one practical remark with regard to our own country. If it is the case that there are some geographical conditions acting in some respects adversely to the development of our commerce, in addition to the keen and enlightened competition of growing rivals, that only adds force to one remark that I have quoted from the *Standard*—"that we are bound to neglect no means of improving, to the utmost, our processes of production and our machinery of distribution." One means of attaining this end, I do not doubt, will be a wise system of education. But I trust that in planning the framework of a system of education with this end in view, it will not be forgotten that all trade is not external (foreign or colonial) trade. There is nothing unpatriotic in expressing the opinion that there would be no cause for dissatisfaction if in the future more of the produce of our industry found markets in Lincolnshire and Norfolk, Lothian and Meath, even if on that account less were sold in Argentina and Peru.

THE MONTHLY RECORD.

EUROPE.

Distribution of Population in the Rhine Province.—One of the careful and elaborate studies of the distribution of population as affected by geographical causes which find special favour among German students, appears in the *Forschungen zur Deutschen Landes- und Volkskunde* (vol. 13, part 3), from the pen of Dr. Ernst Ambrosius. The district selected for study is that on either side of the lower Rhine from Ürdingen and Duisberg in the south to Elten in the north. Taken as a whole this district is marked by comparatively slight variations of level, and the influence of this factor on the movement of population is therefore not so well marked as it often is. Still, Dr. Ambrosius points out, the district may be divided, geographically, into five parallel zones, on the basis of its general relief, and these are taken as its fundamental divisions for the purposes of the study. They are: (1) the line of heights bordering the district on the east; (2) the Rhine valley, including that of the Issel; (3) the groups of hills on the left of the Rhine; (4) the valley of the Niers; (5) the western heights and moors. As a general rule the soil of the river-valleys is composed of rich loam and clay, while on the higher grounds sand and gravel predominate. As might be expected, the population is less dense in the higher zones, where the average per square kilometre varies from

77 to 88, and is congregated chiefly in the river-valleys, especially that of the Rhine, where the average density reaches 241 per square kilometre. Dr. Ambrosius enters very fully into the question of the occupations of the population in their relation to its distribution. In the eastern part of the district, the great aggregation of population is towards the south, in which direction even the sparsely populated eastern zone shows the influence of the iron industry at Sterkrade. In the Rhine valley the industrial towns of the Ruhr district—Duisburg, Ruhrort (the most important river-port in Germany), Meiderich, etc., and Ürdingen, the river-port of the textile industry on the left bank of the river, swell the aggregate of population in the south, while further north, apart from the town of Wesel, which owes its importance to its favourable situation at the mouth of the Lippe, the valley is mainly agricultural. Agriculture is also largely practised in the Niers valley, though silk-weaving, shoe and cigar-making, and some other industries, occupy considerable numbers, especially at the flourishing towns of Geldern and Goch. In the south of this zone, as also of the westernmost of the five zones, the population has diminished of late years, owing to the attraction exercised by the towns immediately to the south engaged in the textile industry.

ASIA.

Survey of India Report for 1899–1900.—The recently issued general report on the operations of the Survey of India Department for 1899–1900, while recording a steady progress in the various departments of the work, has little to tell in the way of new departures or striking operations, most of the surveys carried out during the year being merely continuations of those previously in progress. The principal triangulation in India had during the previous season been linked with the Burma triangulation, and work in this direction was continued by the despatch of detachments for the execution of two minor series, one extending from Manipur to the coast near Akyab, the other connecting this series with the Mandalay meridional. The almost unknown country along the Bengal-Burma boundary has thus received a much-needed attention. Of the parties engaged on topographical work, four have likewise continued to work in Burma, three of them in Upper Burma, the other mainly on the western slopes of the Arakan Yoma hills. The survey of the Lushai hills was continued on the 1-inch scale, and an area of 759 square miles surveyed on that scale. Geographical results of importance are naturally to be expected on or beyond the extreme frontiers of the empire, and the year under review forms no exception to the rule. Valuable surveys were executed by Captain Ryder during a reconnaissance in Yunnan, commenced during the previous season by Captain Davies. The routes were so chosen as to avoid, as far as possible, ground already surveyed, and the result of the season's work was, to use the words of Captain Ryder's report, "that practically every town in the province has now been visited and reported on, every important route and many others have been surveyed and reported on," Captain Ryder's own share amounting to 1400 miles of new routes. The work is so far merely of a reconnaissance nature, no triangulation having been effected, but the results are none the less useful considering the imperfect state of our previous knowledge of the province. Another useful piece of work was done by Captain Robertson during the Mishmi expedition of 1899–1900. The country visited was that of the Northern Mishmis, till then practically unexplored, though a small part of it, as well as the district of the Midu Mishmis, had been mapped by the late Colonel Woodthorpe in 1877–78. The country of the northern section of the tribe is even more rugged and precipitous than that of the rest of the Mishmis. The route followed entailed the passage of a pass 8900 feet above sea-level, the

descent from which to the Ithun, the main stream of the country, was almost impassable for laden coolies. The valleys are everywhere steep and narrow, in places amounting to gorges many thousand feet deep. The slopes, up to 10,000 or 11,000 feet, are covered with a dense mixed forest. Higher up the hills are bare and covered with snow, and glaciers exist in places. Captain Robertson thinks that the Dibang (which where seen had an enormous volume of water) has a larger drainage area than is shown on the maps accompanying A—K's report, but to his great regret he was unable to fix the position of some high snow mountains near its headwaters. Another report deserving mention is that of Major Renny-Tailyour on the concluding season's work of the Burma-China Boundary Commission, while allusion may also be made to the account of a new process for the reproduction of drawings by direct printing upon zinc, which has proved very successful. It is the invention of Mr. Vandyke, of the Lithographic Office, Calcutta.

The Structure of South-East Anatolia.—The regions where the young folded mountains of the Old World abut against the Old World tablelands is of exceptional morphological interest, and has been little studied. Dr. Franz Schaffer, a pupil of Suess, visited it twice in 1900. He gives a summary of his conclusions and a map, whose topography is taken from that issued by the R.G.S. in vol. iii. of the Supplementary Papers, in *Petermanns Mitteilungen* for June. Above the plain of Cilicia, a succession of short, steep-sided, isolated ranges of unfossiliferous limestone rise abruptly, and represent the broken-up relics of pre-Taurus earth-foldings. These strike N.-S., except in the south, where they bend towards the south-west. In the south-west these are covered by the bare limestone plateau of Tracheotis with its Karst landscapes. On the north-west of the plain are the folded mountains of the Taurus, and on the south-east Mons Amanus, Mons Cassius, the Kurd Dagh, and other ranges of similar age. The Taurus ranges strike W.-E. in the south-west, but curve to S.W.-N.E. in the north-west. The Amanus ranges and Cassius are almost parallel to those of the Taurus, and may be regarded as continuations of the north and south Cyprus mountains. The Kurd Dagh is the northern margin of the Syrian tableland affected by the Taurus foldings. The northern continuation of the Jordan-Orontes rift-valley passes from the tableland into the folded region of Eurasia, and can be traced between the Amanus ranges and the Kara Dagh, between Antioch and Marash. Another faulted depression exists north of the Taurus, and extends to the Sakaria. The margins of both are marked by volcanic deposits, which are older than the upper Tertiary deposits. Hence a simple symmetrical arrangement of the features—the Cilician plain is bordered by folded mountain ranges, beyond which are depressions encircled by young volcanic deposits.

The Kizilbash of Cappadocia.—During archæological researches carried out in Northern Asia Minor in the summer of last year, Mr. J. W. Crowfoot found an opportunity to visit some of the Kizilbash villages in the province of Angora, near the eastern bank of the Halys, and the inquiries he made there led to some interesting deductions as to the past history of the people, which are set forth in a paper read before the Anthropological Institute and printed in a recent number of the *Journal* of that body (vol. xxx. p. 305). The traditions and customs still current among the people show, Mr. Crowfoot points out, the great influence still exercised in their minds by the past, memories of the times when they held an independent position prior to the rise of the Osmanli power having not yet died out. Mr. Crowfoot quotes from Purchas' 'Pilgrimage' passages which show that their legends, though no doubt confused, do refer to definite historical occurrences, some of which took place as much as six or seven centuries ago. In the rites and customs still extant among them, notably in the reverence shown to the tombs of

past heroes, he considers that we have the fragments of a pre-Islamic pagan civilization. The people themselves derive their origin from Khorassan, which, as Sir T. Holdich pointed out in a discussion which followed the paper, probably means to them, not the modern province of that name, but the wider area occupied by the Durani empire, which included Afghanistan, Baluchistan, and part of the Punjab, where so many Kizibashis are still resident. Cappadocia has for ages turned to the East rather than to the West, and before the time of Alexander the inhabitants had come under oriental influence and developed a theory of their own, which made them impervious to Greek and Christian missionaries, and which, as described by Strabo, Basil, and Eusebius, can be identified with the practice of the modern Kizilbash. Besides this name, which was originally a term of opprobrium, Mr. Crowfoot found the appellation Bektash in use among the people. The two names, as Sir C. Wilson pointed out, are so wide apart in their original application that their use by one and the same people is difficult to understand. He suggests, however, that the villages occupy land which once belonged to the Bektash Dervishes.

Kozloff's Expedition in Central Asia.—Disquieting news concerning this expedition (cf. *Journal*, vol. xvii. p. 303) was received at Biisk, in Siberia, early in July. A runner from Kobdo brought the intelligence that the party had been attacked by two thousand Tanguts, and though these had been at last beaten off, it was only at the cost of the lives of eight members of the expedition, the position of which was regarded as precarious. It is hoped, however, that the danger has been exaggerated.

AFRICA.

The Earl of Cromer's Report on Egypt* furnishes most gratifying evidence of the country's progress under the able guidance of His Majesty's Agent and Consul-General. The burthens of taxation have been sensibly reduced, and public works are being carried on with energy, yet the revenue exceeds the expenditure. Trade is expanding, and the prosperity of the great body of the people is increasing from year to year. Even the expenditure incurred in the re-occupation of the Sudan—£417,000 in 1901—is borne with ease and without endangering the stability of Egyptian finance. Among matters of special interest, we may mention that a survey of the cataract region to the south of Wadi Halfa is now in progress, and is to be completed in the course of three years. The revenue surveys of the Mudiriyes of Gize and Gharbiye are to be completed by the end of this year, whilst the village and topographical survey of the Fayum, based upon a regular triangulation, is in progress. Triangulations are likewise being carried out on the Mudiriyes of Dakheliye and Kalyubliye. Reports on the geological surveys of the oases are nearly ready for publication.† In the Sudan, Colonel Talbot, in charge of the surveys, is directing operations along the borders of Eritrea and Abyssinia. A full report on the operations of Majors H. H. Austin and C. W. Gwynne has already appeared in this *Journal* (vol. xvii. p. 495), and the latter of these officers has gone to Addis Abbeba to arrange with the Emperor Menelek for a continuation of the survey of the frontier district with a view to the conclusion of a boundary treaty. Colonel Sparkes has gone to the Bahr-el-Ghazal to establish stations. El-Obeid was re-occupied on December 17, 1899, and friendly relations have been established with the

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* 'Egypt,' No. 1 (1901).

† On the Geological Survey of Egypt, see *Geographical Journal*, vol. xvii., 1901, p. 597, and the succeeding note in the present number.

Sheikh Ali Dinar of Dar-Fur, the grandson of the late Sultan Husein. Only a small remnant of the Dervishes under Arabi Dafala are still in the field, in Dar Kara, to the south-west of Dar-Fur. If we add that there are now at work eight meteorological stations, fully equipped, between Alexandria and Omdurman, and that Nile gauges have been established on the Blue Nile and the Sobat, it must be admitted that much is being done for extending the geographical knowledge of the vast regions now under the sway of Egypt and her British adviser.

The Farafra Oasis.—Mr. H. Beadnell, of the geological survey of Egypt, whose surveys in the Nile valley and Libyan desert have already been referred to in the *Journal*, describes the topography and geology of the Farafra oasis in a special paper issued by the Geological Survey. The oasis was known previously chiefly from the work of the Rohlfs expedition of 1873–74, and though generally confirming the results then obtained, the recent survey, undertaken in January and February, 1898, has added considerably to our knowledge in various directions. In particular, the position of the oasis in longitude was fixed with greater precision than had been previously the case, Mr. Beadnell having traversed the desert between Farafra and Assiut, which lie almost on the same parallel of latitude, steering due east and plotting his course by plane-table and compass, the distance being reckoned by a good measuring-wheel. Kasr Farafra, the one village of the oasis, is thus placed in 28° 0′ 15″ E. long. as compared with 28° 5′ as given by the Rohlfs expedition. Farafra, the largest of the depressions in the Libyan desert, has an irregularly triangular shape, with the apex to the north. It is bounded on the north, east, and west by steep cliffs, the altitude of the adjacent plateaux being about 800 feet above that of the oasis. To the south, the floor of the depression rises imperceptibly for some 95 miles until the edge of the Dakhla escarpment is reached. A large part, especially on the east and south-east, is covered with blown sand, which in the latter direction assumes the form of high parallel dunes, running about south-south-east. To the west of Farafra, and separated from it by only about 6 miles of high plateau (even this being possibly breached by a strait at one point), is another extensive depression—that of Iddaila—which is still almost unexplored, its very existence having been overlooked until quite recently. Farafra possesses little economic importance, there being only some twenty springs, most of which are situated near the village under the western escarpment. The water from each of them is carefully controlled so as to irrigate a small patch of ground. A survey of the springs was made by Mr. Beadnell, which improves the sketch-map of the Rohlfs expedition in several particulars. Changes appear to have taken place in them, some having become dry, while others have been opened up. In the depression of Iddaila there are two known localities where water occurs, but at one of the wells it is bitter. The other is a running spring of sweet water, used as a watering-place on the roads from Dakhla and Farafra to Siwa. The population of Farafra was 542 in 1897, and the only exports are dates and a few olives. Geologically the floor of the depression (where not covered with blown sand) consists of white chalk, which appears to dip northwards from the Dakla escarpment nearly up to Kasr Farafra. This chalk also forms a step of the plateau to the north-north-east, and the main part of the plateau separating Farafra from Baharia. Elsewhere the plateau consists of Eocene limestone, underlaid by the Esna shales (also Eocene).

The Forests of the Sudan.—Among the many beneficial results of the new *régime* in the Eastern Sudan, the attention which is being directed to the conservation of the forests, hitherto quite neglected, will be not the least important. The Director of Forests under the new administration, Mr. C. E. Muriel, has lately devoted six months to a tour in the Sudan for the purpose of examining the

principal existing forests, and studying the most suitable means for their maintenance and exploitation. His report, dated May, 1901, deals in the first place with the distribution and present condition of the forests, and in the second with their treatment from the point of view of timber, fuel, and other forest produce. The forests examined were those of the Blue Nile, White Nile and lower Sobat, and Kordofan, but though these are no doubt the most important, many others remain unvisited. The most valuable timber trees of the Sudan forests are those known as kakamut (*Acacia campylacantha*), sant (*A. Arabica*), and inderab (the large-leaved species, *Cordia abyssinica*). The last-named is light and easily worked, and is consequently of more general use than either of the other two, which, though very durable, are hard and heavy. Among other useful timbers, those known as "taraiya" and "heglik" (*Balanites ægyptiaca*) merit attention as supplying longer and straighter logs than many others; while "homeid" (*Sclerocarpa* sp.), though not durable, might serve as a substitute for common deal, which is at present imported in considerable quantities. The exploitation of the forests is at present carried out without system, and straight and well-grown trees are rare owing to the damage caused by fire and grazing. Mr. Muriel suggests various areas as suitable for the formation of timber reserves, the most important being on the Blue Nile. Small areas of good "sant" (the conservation of which is of special importance owing to the employment of the wood for railway sleepers) occur also on the White Nile. For fuel, of which the supply needed by the Government works alone would involve the felling of 4·8 square miles of forest annually, the formation of reserves to be cut on a regular rotation of from fifteen to twenty years is also recommended. Of other forest products, gum, produced chiefly by the "hashab" acacias of Kordofan, is the most important. During the Dervish occupation the gum trade ceased, and many of the "genenas" or plantations were cleared for *dukhn*. Many have since been reformed, and are again yielding gum, but a more systematic treatment is needed. Other forest products are fibres, tans, caoutchouc, gutta percha, etc.

Altitude of Lakes Tanganyika and Mweru.—In a note on the scientific results of the Lemaire expedition (*Journal*, vol. xvii. p. 659) we quoted the values obtained for the altitudes, among other places, of Lakes Tanganyika and Mweru. Captain Lemaire has since recalculated the results with the aid of barometric and thermometric observations taken at Dar-es-Salaam simultaneously with his observations in the centre of the continent, and has communicated the revised figures to the *Mouvement Géographique* for July 14 last. For Tanganyika he obtains altitudes varying within narrow limits, according to the four different *formulæ* employed in the calculation, the extremes being 2741 and 2759 feet. The result previously obtained, 2549 feet, is thus far too low, and this Captain Lemaire attributes to the use of the tables supplied by the late Captain Delporte. Barometric observations taken on the east and west coasts since the date of the compilation of the tables show, he thinks, that a correction of +137 feet must be made in the results obtained from these tables. This correction (combined with another of less importance) would give as the altitude of Tanganyika, 2744 feet—a figure closely agreeing with those mentioned above. Applying the same corrections in the case of Mweru, Captain Lemaire obtains a height of 3189 feet, while by the use of the *formulæ* of Babinet and Augot the figures are, respectively, 3181 and 3198 feet, so that here too there is a satisfactory agreement between the results. It may be noted that whereas this revision places Captain Lemaire's result for Tanganyika in close agreement with that of previous travellers (*e.g.* Stanley, 2756 feet), it increases the divergence in the case of Mweru. Previous observations here had, however been less numerous and trustworthy than those on Tanganyika.

The Rufiji Delta.—An account by Captain Prüssing, of the various channels which compose the Rufiji delta, appears in the second number of the *Mitteilungen aus den Deutschen Schutzgebieten* for the present year, accompanied by an excellent map by Herr Sprigade. Captain Prüssing, who speaks from personal knowledge gained during careful surveys, gives a detailed description, as regards depth, navigability, etc., of the separate arms of the river, of which the most important is that known as the Mto Suninga, which enters the sea by the Simba Uranga mouth. On this arm, the bar of which can always be crossed by ocean vessels at high water, lie the sawmills of the Rufiji Industries Company, and higher up the forest station of Salale. At both of these the river has a depth of 16 feet, so that the largest native craft can always take in cargoes. Like most of the delta arms, the Mto Suninga becomes very shallow at a distance from the sea, and there is no possibility of continuous navigation to the upper Rufiji. There are loading-places for wood on other arms, and much of the land is said to be very suitable for rice growing. Buoys have been placed in several of the mouths to facilitate navigation, but owing to the shifting nature of the channels, constant surveys, and occasional rearrangement of the buoys, will be necessary.

The Etinde Volcano, Kamerun.—Dr. Esch, of Berlin, who has lately made a careful study of the Etinde volcano in the Kamerun territory, gives the results of his investigations in the *Sitzungsberichte* of the Prussian Academy of Sciences (1901, part xii.). The volcano, though quite independent of the better known Kamerun peak, has received little attention at the hands of travellers, but it offers many points of interest to scientific geographers. Its summit lies almost exactly on the line of volcanic activity running from the Kamerun peak, through Clarence peak on Fernando Po, and the eruptive centres of the islands of Principe, São Thome, and Annobon. At a distance of only 3 miles from the coast it rises, at an elevation of some 3500 feet, from the broad platform of the Kamerun peak, its summit reaching a height of 6500 feet above the sea. Its slopes, which fall almost precipitously towards the sea, are free from the lavas, ashes, and tuffs which cover the base of its larger neighbour, and whereas this latter, with its subsidiary cones, shows little traces of modification of form by erosion, Etinde is cut up by deep ravines forming steep narrow ridges, which would be inaccessible were it not for the thick bush which covers them. This fact had previously stood in the way of the ascent of the peak, which was accomplished for the first time by Dr. Esch. Although its age cannot be determined with certainty, there is no doubt that it represents one of the oldest outbursts in the district. It differs equally in the composition of its rocks from the neighbouring Kamerun peak, for whereas this presents only basalts and andesite, Etinde consists only of leucite and allied rocks, in which felspar is altogether wanting. The petrographical character of these rocks forms the subject of the greater part of Dr. Esch's paper.

AMERICA.

Nicholas Garry's Journeys in Canada, 1821.—A hitherto unpublished diary, kept by Nicholas Garry of the Hudson's Bay Company during his visit to the interior settlements in 1821, has lately been printed in the *Transactions* of the Royal Society of Canada (vol. vi. sect. 2). The journey it describes was undertaken on the amalgamation of the Hudson's Bay and North-West Companies, it being thought desirable that the settlements should be visited by representatives of both companies for the purpose of giving effect to the arrangements necessitated by their union. The diary was kept from day to day during the journey, and is of much interest from the vivid picture

it presents of the dangers and hardships involved by such a journey in the early days of Canadian settlement, as well as from the valuable information it supplies as to the state of affairs in the far interior at a critical period in Canadian history. The voyage was made by the frail birch-bark canoes which then formed the only means of communication with the distant settlements, and led by the usual route *viâ* the Ottawa and the upper lakes to the Red river settlement, and thence by Lake Winnipeg to Fort York, near the mouth of the Nelson river. Nicholas Garry, from whom the well-known Fort Garry in the Red river district took its name, and who was deputy-governor of the Hudson's Bay Company from 1822 to 1835, describes his experiences in a straightforward and unassuming style, and shows himself to have been actuated by a sincere desire to carry out his commission in a way which should further the best interests both of the Company and its employés and of the settlers in those remote regions. He seems to have been a shrewd observer, and his journal abounds with interesting accounts of the scenery and natural productions of the regions passed through, the habits and methods of the hardy Canadian voyageurs, and the general state of the country at the time. We learn that the settlement of Canada proper ceased at that time a little beyond the Lac des Alumettes on the Ottawa river, no cultivated ground being seen beyond this point except in the vicinity of the trading ports. The fortunes of the Red river settlement were then by no means promising, the colonists being exposed to hardships of all kinds. The agricultural capabilities of the country were, however, fully recognized by Garry, who speaks of the excellence of the fine black soil and the verdure and luxuriance of the grass. From Fort York, whence a visit was paid to the Nelson river to test its capabilities for anchorage as well as the suitability of its shores for the site of a fort, Garry returned to England by sea, the passage of Hudson strait occupying seventeen days. The diary has been communicated to the Royal Society of Canada by Canon Garry, son of the writer, whose grandson, Mr. Francis Garry, has carried out the difficult work of transcription, besides elucidating the text by valuable notes.

Urban Population of the United States.—A recently issued bulletin (No. 70) on the twelfth census of the United States, discusses the position of the urban population of that country in 1900 as compared with previous censuses, particularly those of 1880 and 1890. Tables are given showing in detail the facts at the different censuses grouped in a variety of ways, but it is only to the wider aspects of distribution brought out by these tables that reference can be made here. For purposes of comparison with earlier censuses the lower limit of town population is taken arbitrarily at the comparatively high figure of 8000, but figures are also given in some cases on the basis of a limit of 4000, which is in many ways more consistent with the natural division between town and rural population. On the former basis it is found that the urban population of the United States reached a total of 25,000,000 in 1900 as compared with a total of very nearly 18,300,000 in 1890, giving a percentage to total population of 32·9 as compared with one of 29 in 1890. Excluding the population of Indian territory and reservations, and of Hawaii, these percentages stand at 33·1 and 29·2 respectively. Between 1790 and 1900 the proportion of urban to total population has steadily risen from 3·4 to 33·1 per cent., the increase during the past half-century having been from 12·5 to 33·1. Taking the lower limit, there were in 1900 28,411,698 persons living in 1158 incorporated places and New England "towns" of 4000 inhabitants and over, and constituting 37·3 of the total population of the country. The proportion of urban population naturally differs immensely in the different geographical divisions of the United States. In the North Atlantic division it reached in 1900 the high figure of 64·7 per cent., as compared with 35·5 and 35·9 per cent. in the

North Central and Western divisions respectively, and 19·6 and 13·5 in the South Atlantic and South Central divisions respectively. There are nine individual states in which the urban population ranged in 1900 from not quite one-half to over nine-tenths of their total population, and 19 states and territories in which the proportion was less than one-sixth. The *increase* during the decade in the urban population is, as might be expected, greatest in the more newly settled portions of the whole area, reaching 41·9 per cent. in the western division as compared with 35·2 per cent. in the North Atlantic and 31·9 in the South Atlantic division. The most significant growth of cities in the whole country is that for the three cities in the state of Washington—Seattle, Spokane, and Tacoma—which in 1880 had together a population of only 4981, but which had in 1890 a combined population of 98,765, and in 1900, one of 155,233, the increase during the last decade being 57·2 per cent.

AUSTRALASIA AND PACIFIC ISLANDS.

Captain Cook in New South Wales.—Mr. James Bonwick has printed a brochure on the subject of the naming of Botany bay and New South Wales as recorded in the official narrative of Cook's first voyage and in other narratives, which, though undoubtedly authentic and original, differ in a surprising way from the first-named. This, as is well known, was compiled under instructions from the Admiralty by Dr. Hawkesworth, who, however, gave no clear indication of the sources from which he drew his information. Mr. Bonwick holds that Hawkesworth had access to no original account of the voyage of the *Endeavour*, those now available having, in his opinion, never passed through the compiler's hands. Of these original logs the most important are (1) that in Cook's own hand now in the British Museum; (2) the copy, also in the Museum, to which it was presented by Sir Joseph Banks; (3) another copy signed by Cook and presented by him to his old commander, Sir Hugh Palliser. There are also various logs kept by officers of the ship, which were discovered, about a hundred years after the date of the voyage, behind some wainscotting at the Deptford victualling yard. Neither Cook's own logs nor these Deptford logs make any mention of Botany Bay or New South Wales, names which appear, as if bestowed by Cook during the voyage, in the official version by Hawkesworth. Several other logs, however, have spaces filled up, apparently in this country, with these and other names, in a handwriting differing from that of the bulk of the narratives. Among these Mr. Bonwick classes the copies of Cook's journal, one of which, generally known as Corner's, was used by Admiral Wharton when printing the journal for the first time in 1893. Mr. Bonwick casts doubts on the genuineness of this journal, although from the presence of a marginal note in Cook's own handwriting, he is forced to allow that it passed through Cook's hand. As to the reason for the change of the name originally bestowed by Cook (Stingray bay) to Botany bay, he has only some rather vague suggestions to make, one being that the "Dauphin map" of 1542, with its "Baie des Plantes," had come to light in the interval, and that the object was to revive the ancient name. He thus takes for granted the exceedingly doubtful proposition that the coast shown on the old Dieppe maps really represents the eastern coast of Australia.

Visit to Bougainville Island.—A recent number of *Globus* (vol. lxxx. No. 4) contains a short note on a visit to Bougainville island, carried out by a missionary settled in the adjoining Shortland group (Poporag of the natives). The Catholic missionaries who have established themselves here have succeeded in reaching the villages placed on the interior mountains of Bougainville, and to establish friendly relations with the inhabitants, though these were at first

exceedingly shy. The villages are placed on spurs or crests of the mountains, so that the people can watch all the paths by which they are approached. Watchmen are also placed in the highest trees, usually old bread-fruit trees, who keep watch over the coast lands, the dwellers in which are hostile to the mountaineers. On the north-east coast pile-dwellings were seen, but huts on the south-west coast were all placed on the level ground. The various tribes live in great isolation, and it is therefore not surprising to find a great variety of languages, thirty of which, too divergent to be termed dialects, are estimated by the missionaries to be in use on the island. Polygamy is prevalent, but even the chiefs have rarely more than five wives. Cannibalism is restricted to about a third of the island, but human sacrifices, practised chiefly at the building of canoes or the death of a chief, prevail everywhere. Exception is taken to the inclusion of the Shortland islands in the British sphere by the latest Anglo-German agreement. The natives stand in close relations with those of the neighbouring coast of Bougainville, from which they obtain their wives; and any curtailment of intercourse would, it is said, lead to the extinction of the Shortland islanders.

POLAR REGIONS.

News of Peary.—The long-expected news of the doings, during the past two seasons, of the American Polar Expedition under Lieut. Peary, has at last come to hand. The steamer *Erik* which, as already announced in the *Journal*, sailed for the north from Sydney, Cape Breton, in July last, returned to the same port early in September, having been successful in opening up communication with the gallant explorer, and bringing home Mrs. Peary, who went out last year in the *Windward*. The work so far accomplished, though hardly realizing the expectation which had been formed as regards the advance northwards, is valuable from a geographical point of view as bringing to light for the first time the configuration of the whole northern coast of Greenland, on which Lieut. Peary has reached a more northerly point than had hitherto been attained. According to the scanty accounts yet published in the newspapers, the *Windward* was imprisoned in the ice at Payer harbour, in the vicinity of Cape Sabine, and there remained for eight months. Peary arrived on June 6 of this year, having wintered in the far north. He had started from Etah on April 15, 1900, with Henson and five Eskimo, and on May 8 reached the most northerly point attained by Lieut. Lockwood during the Greely Expedition, which is now, according to the newspaper reports, placed in 83° 30′ 25″, instead of 83° 24′ as originally given. Following the coast to 83° 39′, Peary found that it suddenly curved eastward. He therefore struck north towards the pole, but, having advanced over a disintegrated pack to 83° 50′, the highest latitude yet reached in the western hemisphere, was here stopped by open water. Returning southward, he continued his march eastward along the Greenland coast, until in 83° N., 25° W., he recognized the bold headland adjoining Independence bay, discovered by him in 1891. On June 15 he arrived at Fort Conger, having completed an accurate chart of the northern coast of Greenland, which in the part newly explored, is said to resemble Grinnell land, and to be evidently the littoral of the true arctic basin. Another attempted march towards the pole had to be abandoned, as neither men nor dogs proved in condition for the work. Peary has decided, however, to spend another winter in the north, and hopes to undertake a fresh expedition in the spring of next year.

The Baldwin Arctic Expedition.—A telegram was received on August 29 by the American Consul at Christiania, stating that the *Frithjof*, one of the vessels employed for the transport of the Baldwin Arctic Expedition to Franz Josef

Land, had returned to Hammerfest after safely landing the stores of the expedition at Cape Ziegler, in 80° 24′ N., 55° 52′ E. All the members of the expedition were stated to be in good health, and the dogs and ponies in good condition. The voyage to Cape Ziegler had occupied a month, and when the *Frithjof* sailed, the conditions were favourable for an advance northward, which Prof. Baldwin proposed to commence on the following day. It was reported at Hammerfest that several new islands had been discovered during the voyage to Franz Josef Land.

The Swedish Antarctic Expedition.—Information was received from Dr. Otto Nordenskiöld early in September to the effect that the sailing of the Swedish Antarctic Expedition had been provisionally fixed for the end of the month, by which time it was expected that the *Antarctic*, in which the voyage is to be made, and which has already acquired celebrity in connection with former Swedish, Norwegian, and Danish expeditions, would have returned from Spitsbergen, whither it proceeded early in the summer with the Swedish party for the measurement of an arc of the meridian. The leader of the expedition, Dr. Otto Nordenskiöld, will take charge of the geographical and geological work, and the other scientific members of the staff are: Dr. A. Ohlin and Mr. K. Anderson, zoologists; Mr. C. Skottsberg, botanist; Dr. G. Bodman, magnetician and hydrographer; and Dr. E. Ekelöf, medical officer and bacteriologist. An artist will probably also take part in the expedition, and an additional scientist will leave Sweden for the winter campaign of the ship. The command of the latter is entrusted to Captain C. A. Larsen, already well known for the part he has played in antarctic voyages. From Sweden the *Antarctic* will proceed direct to Buenos Aires, and thence by Staten island (where the instruments will be compared with those of the Argentine scientific station) to the South Shetlands and the east coast of Graham Land (King Oscar Land). Hence it is proposed to attempt an advance southward by the route described by Sir Clements Markham in the July number of the *Journal* as the "fifth route." The first task to be undertaken will therefore be to determine whether Graham land is an island or part of an extensive continent. In the latter case it might perhaps be possible to advance for a considerable distance by this route. In any case, if a suitable spot for the winter quarters can be found here, a station will be established for six or seven persons, under the command of Dr. Nordenskiöld himself, and observations carried out in harmony with those of the British and German expeditions. In case, however, no suitable quarters can be found, it will be necessary to plant the station somewhat further north, possibly in the neighbourhood of Cape Seymour. The ship, with two or three members of the scientific staff, will make the best use possible of the antarctic summer, and will then return to South America and the Falkland islands, where it will remain for the winter, the principal attention being devoted to biological work. On the approach of spring a course will be laid for the south, and work will be continued in the neighbourhood of the South Shetlands and along the ice-barrier, until it is found possible to push on to the winter station. It will then depend on circumstances whether the united expedition will make an attempt to examine carefully the route followed by Weddell in 1823, a factor in the case being the proposed co-operation, during the summer, with the Scottish expedition under Mr. Bruce. But in any case, the return to Sweden must be fixed for the end of the summer of 1902–3.

GENERAL.

The Oxford School of Geography.—To a syllabus just issued of the regulations in force at the Oxford School of Geography is appended a reprint of the examination papers set this year for the diploma in geography, which was awarded

to four candidates. It is satisfactory to note that a fairly high standard of knowledge is required of the candidates, the questions being often of a decidedly searching character, demanding a thorough grasp of the principles of the science. Papers were set in seven subdivisions of the subject, grouped in two main classes. Those in the first of these, viz. general physical geography and regional geography, are obligatory, while three papers only of the second group are to be selected by the candidates. Seven sub-headings of this group are defined, but papers were set this year in five only, the remaining two, ancient historical geography and military geography, being taken up by none of the candidates. Under the head of regional geography are included, in addition to some knowledge respecting the physical regions of the world and the distribution of plants and animals, "the chief facts of modern political and economic geography considered in relation to the influence of physical features." It thus covers a wide ground, which might perhaps be thought of too much importance to be dealt with in a single paper. The subjects of the second group are in part extensions of the general physical geography dealt with in the first group (*e.g.* geology, climatology, geomorphology) treated more in detail, and in part more special subjects, such as the history of geography and the principles of surveying and cartography. Inquiries with reference to the school are to be addressed to Mr. H. J. Mackinder, School of Geography, Old Ashmolean Building, Broad Street, Oxford.

OBITUARY.

Baron Nordenskiöld.

Geographical science has sustained a severe loss by the death, which occurred on August 12, of Baron A. E. Nordenskiöld, the distinguished arctic explorer and authority on early cartography. Few geographers of our own day have combined, to so high a degree, a thorough scientific training with the work of an explorer in the field, and it would be difficult to name a contemporary who could be said to surpass, perhaps even to equal, the deceased Swedish *savant* in his wide grasp of the various branches of the science to which the best years of his life were devoted.

Adolf Erik Nordenskiöld was born at Helsingfors, in Finland, on November 18, 1832, and though during the greater part of his career his home was in Sweden, he retained throughout a warm interest in the affairs of his native land, which has so long been intimately connected with its southern neighbour by family and other ties. His ancestors came originally from Sweden, but had for some generations been settled in Finland, where his great-great-grandfather, Johan Erik Nordenberg, was superintendent of the saltpetre manufactories at Nyland. Various members of the family were noted for their devotion to scientific pursuits, not the least distinguished being Nils Gustav, the father of the deceased explorer, who early acquired a reputation as a mineralogist, and in 1824 became head of the Mining Office in Finland. To his influence, therefore, may be ascribed the early direction of the mind of the son towards those geological studies by which the groundwork was laid of his future high qualifications as a scientific explorer. Nordenskiöld entered the University of Helsingfors in 1849, and devoted especial attention to chemical and mineralogical work, which he likewise prosecuted during excursions in the vacations, and especially during a visit to the Urals, which he undertook with his father in 1853. He had already obtained appointments, with small salaries, both at the University and the Mining Office,

when he had the misfortune to arouse the suspicion of the Russian authorities through a supposed political allusion in an after-dinner speech. This cost him his appointments, but did not immediately result in the change of domicile which had so important an effect on his subsequent career. After working for a time in Berlin, he returned to Finland, where he obtained the Alexander travelling stipend at Helsingfors University, having formed a plan for geological research in Siberia and Kamchatka. But at a congregation at the University, at which he was to take his Doctor's degree before setting out on his travels, an incident took

BARON ADOLF ERIK NORDENSKIÖLD.

place by which he again fell under the displeasure of the authorities, and was finally forced to leave the country. He settled at Stockholm during the winter of 1857–58, and though the prohibition to visit Finland was subsequently withdrawn, Sweden became thenceforth his adopted country.

It was in the spring of 1858 that Nordenskiöld received an offer to take part as geologist in the first expedition to Spitsbergen, led by the Swedish geologist Otto Torell, whose death preceded by less than a year that of his distinguished associate. This was the beginning of a long period of useful work in the arctic regions, which

perhaps did more than anything within the same period to revolutionize our knowledge of those northern parts of the world. At the time of Torell's first voyage, Spitsbergen, though its coasts had been known for more than two centuries and a half, had never been scientifically explored, and the knowledge possessed, not only of its geology, but even of the topography of its interior, was of the most meagre kind. Torell's attention had been directed to it by his research on glacial phenomena, for the prosecution of which it was necessary to obtain more accurate knowledge of the conditions still prevailing in the far north. Valuable observations were made during the voyage, an important result being the discovery, by Nordenskiöld, at Bell sound, of remains of tertiary plants, which with others found by subsequent expeditions have led to such important conclusions respecting the climates which prevailed in former epochs. The expedition returned during the same year, and before its close Nordenskiöld received the important appointment of Professor and Curator of the mineralogical department of the Swedish "Riks-museum." During his long tenure of this office it was his constant endeavour to add to the extensive collections at the museum both by purchase and by private efforts.

In 1861 Nordenskiöld took part in Torell's second Spitsbergen expedition, which had still more important results as regards the geological history of that region, the whole northern part of the island group being for the first time carefully examined from this point of view. The expedition had been partly organized with a view to testing the practicability of the measurement of an arc of the meridian, as suggested by the President of the Royal Society of London. A beginning towards this important operation was made by the study of the ground for the necessary triangulation in the northern part of the main island.

In July, 1863, Nordenskiöld married Anna, daughter of Count Karl Mannerheim, a Finnish lady, to whom he had betrothed himself during a visit in 1862 to his native land. Further arctic exploration seemed removed from his future sphere of labour, when in 1864 he was asked by the Swedish Academy to take command, in the place of Dr. K. Chydenius, of a new expedition for the continuance of the work in connection with the proposed degree-measurement. During this expedition, in which he was accompanied by Dunér and Malmgren, the southern part of Spitsbergen was mapped, and valuable botanical and zoological investigations carried out. An attempt to reach a high northern latitude was made in the autumn of that year, but, in spite of the fact that the water was unusually open, was frustrated by the necessity of rescuing a party of shipwrecked walrus-hunters. The hope of accomplishing something in this direction was not, however, abandoned, and after an interval of three years Nordenskiöld succeeded in obtaining the despatch of a well-organized expedition, supported by the Swedish Government as well as by private patrons, among whom Oscar Dickson, the future munificent supporter of so many arctic ventures, was included. The iron steamer *Sofia* was placed at the professor's disposal, and in it he accomplished a successful voyage, reaching, in lat. 81° 42′ N., a higher northern latitude than is known to have been attained, down to that date, in the eastern hemisphere.

By this time the exploration of the arctic regions had become an absorbing object on the part of Nordenskiöld, who continued to devote his best energies to its attainment. An offer by Mr. Oscar Dickson to contribute to the despatch of a new expedition was joyfully accepted, and a trip was undertaken in 1870 to Greenland for the purpose of studying the applicability of dogs for sledge journeys, it being proposed to attempt such a journey northwards from the north of Spitsbergen. In itself, however, the visit led to valuable scientific results. In particular, an examination of the geological structure of the country was for the

first time made, and the vast inland ice-sheet of Greenland first trodden by a scientific observer. To Dr. Berggren, his companion, was due the important discovery of a scanty vegetation of *algæ* covering the ice-sheet. The main expedition did not start until 1872, and, owing to unforeseen circumstances, was not so successful as had been hoped. The two tenders were caught in the ice, and the crews of three vessels were thus unexpectedly forced to winter in Spitsbergen, involving an insufficiency of provisions. Valuable researches on the aurora and its spectrum, on the development of vegetation during the winter, and on the arctic flora of past epochs, with complete magnetic and meteorological observations, were however made. Undeterred by the experiences of 1872–73, Mr. Dickson resolved to continue operations, and in 1875 work was commenced in a new field by a voyage, in a sailing vessel, to the mouth of the Yenesei, which river was ascended to Yeneseisk. The voyage attracted special attention from the possibility which seemed opened of the inauguration of a commercial sea-route from Europe to Northern Asia, towards which such persevering efforts were put forth, both before and since, by our countryman, Captain Wiggins. Further voyages were made in the following year, and, besides resulting in the usual rich harvest of scientific results, led indirectly to the inception of the most important undertaking with which Nordenskiöld's name is associated, and in which the "north-east passage" round the northern shores of Europe and Asia, so long a desideratum on the part of navigators, was at last successfully accomplished.

Into the details of the memorable voyage of the *Vega*, the main outlines of which are familiar to all interested in polar voyages, we cannot enter here. The *Vega*, under the naval command of Lieut. Palander, left Karlskrona on June 22, 1878, doubled Cape Cheluiskin, the most northern point of the Old World, in the following August, and, after approaching within 100 miles of Bering strait, was finally frozen in at the end of September, and thus forced to winter in the arctic, the voyage being successfully continued on the approach of the following summer. The record of the expedition, in which, under the title 'The Voyage of the *Vega*,' an excellent account was given to the public, both of the events of the voyage and the main scientific results, is probably the most widely known of Nordenskiöld's writings. The full record of the scientific observations, which were among the most valuable ever brought home by an arctic expedition, were afterwards published in Sweden in five bulky volumes.

Nordenskiöld's last arctic expedition was that to Greenland in 1883, during which a successful attempt was made to penetrate the interior over the vast inland ice-sheet. Its chief result was to negative the idea, which had been entertained by the explorer, that a region free from ice might possibly exist in the centre of the country, but valuable information as to the structure and nature of the ice-sheet was also obtained. During the latter years of his life, Nordenskiöld paid much attention to the early history of cartography, and his two monumental works, indispensable to every student of that subject, are too well known to need description here. The second of these, on which the title 'Periplus' was bestowed, opened up a practically new field of research in relation to the early charts and sailing directions in use among European navigators.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. *B.S G. Lyon* 17 (1901): 205–214. **Perreau.**
Le Grand Saint-Bernard et Napoléon. Par Capitaine Perreau.

Alps—Subdivisions. *M. Deutsch u. Oesterreich. Alpenv.* (1901): 93–98. **Gerbers.**
Uebersichtliche Eintheilung der Ostalpen. Von Hugo Gerbers.

Austria-Hungary. *M. Militär-G.I.* 20 (1900): 96–121. ——
Die Fortsetzung des Präcisions-Nivellements, ausgeführt im Jahre 1900.

Denmark—Meteorology. ——
Nautical-Meteorological Annual, 1900. Published by the Danish Meteorological Institute. Kjøbenhavn: G. E. C. Gad, 1901. Size 12½ × 9½, pp. xxviii. and 202. *Maps and Diagrams. Presented by the Danish Meteorological Institute.*

France. *B.G. Hist. et Descriptive* (1900): 237–262. **Fournier.**
Les chemins de transhumance en Provence et en Dauphiné (xviii^e. siècle). Par M. J. Fournier.

On the routes followed in the annual migration of the flocks in search of pasture.

France. *A travers le Monde, Tour du Monde*, 7 (1901): 233–235. **Mauberger.**
Une ville morte en Saintonge. Une visite à Brouage. Par G. Mauberger. *With Illustrations.*

Three centuries ago Brouage was an important military and commercial centre, but is now a small town rarely visited by outsiders.

France. *B.S.G. Lyon* 17 (1901): 220–262. **Privat-Deschanel.**
Hydrologie et hydrographie beaujolaises. Par M. Paul Privat-Deschanel. *With Diagrams.*

A careful study of the hydrography, both above ground and subterranean, of the region between the Saône and the Loire.

France. *Ciel et Terre* 22 (1901): 1–6. **Rocquigny-Adanson.**
Époque de la floraison du Perce-neige dans le centre de la France. Par G. de Rocquigny-Adanson.

Observations on the date of flowering of the snowdrop have been made at the park of Baleine since 1857, with an interval of four years only. The earliest date recorded, in 1873, was January 5, but the total number of January records was only thirteen.

France—Auvergne. *C. Rd.* 133 (1901): 176–178. **Glangeaud.**
Formation de nappes de glace, en été, dans les volcans d'Auvergne. Par M. Ph. Glangeaud.

This is referred to in the Monthly Record for September (p. 307).

France—Gascony. *B.G. Hist. et Descriptive* (1900): 121–134. **Bladé.**
Géographie féodale des Comtés de Fézensac et d'Armagnac. Par M. J.-Fr. Bladé.

France—Isle of Aix. *B.G. Hist. et Descriptive* (1900): 174–176. **Pawlowski.**
Carte-plan de l'île d'Aix, dressée par Cornuau en 1672. Présentée avec une note explicative, par M. A. Pawlowski. *With Sketch-map.*

France—Lille. *B.G. Hist. et Descriptive* (1900): 355–430. **Quarré-Reybourbon.**
Plans anciens et modernes de la ville de Lille, suivis des cartes de la châtellenie de Lille. Par M. Quarré-Reybourbon.

France—Place-names. *B.G. Hist. et Descriptive* (1900): 92–120. **Loisne.**
Sur les formes originales des noms de lieux du Pas-de-Calais et leurs formes officielles. Par M. A. de Loisne.

France—Touraine. *B.G. Hist. et Descriptive* (1900): 210–236. **Chauvigné.**
Inventaire des cartes anciennes et modernes de Touraine. Par M. A. Chauvigné.

Germany—Frankfurt am Main. ———
Beiträge zur Statistik der Stadt Frankfurt am Main. N.F. Drittes Heft: Tabellarische Uebersichten, betreffend dem Civilstand der Stadt Frankfurt a. M. in den Jahren 1892 bis 1900 (pp. 18 and cclx.); Viertes Heft: Frankfurter Krankheitstafeln. Frankfurt a. M., 1900–1901. Size 11 × 7½, pp. 56 and lxxxii. *Diagrams.*

Germany—Prussia. **Ambrosius.**
Die Volksdichte am Deutschen Niederrhein. Von Dr. Ernst Ambrosius. (Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. XIII. Band, Heft 3.) Stuttgart: J. Engelhorn, 1901. Size 9½ × 6½, pp. 157–267. *Maps.*

This is referred to in the Monthly Record (*ante*, p. 438).

ASIA.

Central Asia. **Bobrinsky.**
Ornament of the Tajiks of Darwaz (The Highlands of Bukhara). Central Asia. By Count A. Bobrinsky. [In Russian.] Moscow, 1900. Size 15 × 11½, pp. 18. *Plates. Presented by the Author.*

China. *National G. Mag.* 12 (1901): 266–272. **Barrett.**
China: Her History and Development. By John Barrett.

China. *B.S.G. Lille* 35 (1901): 397–410. **Leclère.**
Les ressources minérales des provinces chinoises voisines du Tonkin. Par A. Leclère.

China. *J.R. United Service I.* 45 (1901): 272–280, 435–446. **Matusovski.**
Information relating to the Chinese Empire. From the Russian of Lieut. Z. Matusovski. Translated by Lieut.-Colonel W. E. Gowan.

China—Manchuria. **Ilinski and Bretschneider.**
Notes on the Kwantung Territory in South Manchuria and the adjacent Islands leased by China to Russia. By Lieut.-Colonel Ilinski and Dr. E. Bretschneider. [In Russian.] St. Petersburg, 1900. Size 9½ × 6, pp. 26 and 28. *Map. Presented by Dr. E. Bretschneider.*

A reprint from the *Izvestiya* of the Russian Geographical Society.

China—Manchuria. *Scottish G. Mag.* 17 (1901): 303–310. **Ross.**
Trade-Routes in Manchuria. By Rev. John Ross.

China—Telegraph Cable. ———
Submarine Telegraph Contract (Chefoo and Wei-Hai-Wei). Copy of "Agreement made April 23, 1901, between His Majesty's Government and the Eastern Extension, Australasia, and China Telegraph Company, Ltd., for the provision

and working of a Submarine Cable between Chefoo and Wei-Hai-Wei, together with a copy of the Treasury Minute thereon, dated April 24, 1901." London: Eyre & Spottiswoode, 1901. Size 13 × 8½, pp. 8.

China and Tongking. *A travers le Monde, Tour du Monde* 7 (1901): 221–222. ——
Le chemin de fer de Haiphong à Yunnan-Sen. *With Map.*

Chinese Turkestan. **Stein.**
Note on Topographical Work in Chinese Turkestan. By Dr. M. A. Stein. (From the *Geographical Journal* for April, 1901.) Size 10 × 6½, pp. 6.

Eastern Asia. *Petermanns M.* **47** (1901): 140–142. **Futterer.**
Ueber Gestalt und Gliederung einer Grundlinie in der Morphologie Ostasiens. Nach F. v. Richthofen. Von K. Futterer.

A note on the original paper was given in the *Journal* for June (p. 658).

Eastern Asia. *Sitzb. K.P. Akad. Wissens. Berlin* (1901) xxxvi.: 782–808. **Richthofen.**
Geomorphologische Studien aus Ostasien. II. Gestalt und Gliederung der ostasiatischen Küstenbogen. Von Ferdinand von Richthofen. *Also separate copy, presented by the Author.*

French Indo-China. *B.G. Hist. et Descriptive* (1900): 284–322. **Durand.**
Les Moïs du So'n-Phòng. Par M. F.-M. Durand.

India—Andaman Islands. *Indian Antiquary* **30** (1901): 232–238. **Temple.**
An unpublished Eighteenth Century Document about the Andamans. By R. C. Temple.

Forms part of a manuscript in the India Office by Captain Ritchie, which also includes the description of the Nicobars already published in the same journal (cf. *G.J.*, vol. xvii. p. 550).

India—Assam. ——
Report on the Administration of the Province of Assam for the year 1899–1900. Shillong, 1901. Size 13½ × 8½, pp. xii., 178, and ccciv. *Maps.*

India—Assam. ——
Report on Tea Culture in Assam for the year 1900. Shillong, 1901. Size 13 × 8½, pp. 4 and iv.

India—Bombay Observations. **Moos.**
Magnetical, Meteorological, and Seismological Observations made at the Government Observatory, Bombay, in the years 1898 and 1899, under the direction of N. A. F. Moos. With Appendices. Bombay, 1901. Size 14 × 10. *Diagrams. Presented by the Colaba Government Observatory, Bombay.*

India—Census. *J.R. Statistical S.* **64** (1901): 314–327. **Baines.**
The Indian Census. By J. A. Baines, C.S.I.

India—Punjab. ——
Report on the Administration of the Punjab and its Dependencies for 1899–1900. Lahore, 1901. Size 13½ × 8½, pp. xiv., 276, and ccxlviii. *Map and Diagram.*

India—Survey Report. ——
General Report on the Operations of the Survey of India Department, administered under the Government of India during 1899–1900. Prepared under the direction of Col. St. G. C. Gore. Calcutta, 1901. Size 13½ × 8½, pp. 110 and 30. *Maps and Plates. Presented by the Survey of India.*

This is noticed in the Monthly Record (*ante*, p. 439).

India—West Frontier. **Holdich.**
The Geography of the North-West Frontier of India. By Colonel Sir Thomas Holdich. (From the *Geographical Journal* for May, 1901.) Size 10 × 6½, pp. 18. *Map.*

India—Wrecks and Casualties. **Beaumont.**
Return of Wrecks and Casualties in Indian Waters for the year 1899, together with a chart showing the positions in which they occurred, and a diagram showing comparative numbers of the reported maritime casualties, etc., the total tonnage, and the number of lives lost, for the past twenty-three years. Prepared by Commander E. J. Beaumont. Calcutta, 1900. Size 13 × 8, pp. 72. *Presented by Commander Beaumont.*

AFRICA.

Abyssinia. **Wellby.**
'Twixt Sirdar and Menelik. An account of a year's Expedition from Zeila to Cairo through Unknown Abyssinia. By the late Captain M. S. Wellby. London and New York: Harper & Brothers, 1901. Size 9 × 6, pp. xxvi. and 410. *Maps and Illustrations. Presented by the Publishers.*

This will be noticed elsewhere.

Central Africa. *Miss. Catholiques* **33** (1901): 275–276. **Vuillot.**
Carte des Missions Catholiques du Centre Africain. Par M. Paul Vuillot. *Map.*

The map embraces the zone between 2° N. and 20° S.

Congo State. **Levy.**
Im belgischen Congostaate. Streiflichter aus dem modernen Afrika. Von Victor Levy. Wien: L. Rosner, 1901. Size 9½ × 6, pp. viii. and 118. *Illustrations. Presented by the Author.*

Written with a view to showing what the Belgians have accomplished on the Congo, and directing popular attention to a country of the capabilities of which the author has a high opinion. He professes to approach the subject entirely without bias.

Congo State—Lomami. *Mouvement G.* **18** (1901): 357–358. **[Wauters.]**
La Carte du Lomami. *With Map.*

M. Wauters publishes a new map embodying the results of recent journeys by agents of the Lomami Company.

Egypt. *Globus* **79** (1901): 375–379. **[Kelly.]**
Abseits vom Wege in Ägypten. Von R. T. K. *With Illustrations.*

Egyptian Sudan. **Austin.**
Survey of the Sobat Region. By Major H. H. Austin. (From the *Geographical Journal* for May, 1901.) Size 10 × 6½, pp. 18. *Map and Illustrations.*

Egyptian Sudan. *Globus* **79** (1901): 379–381. **Förster.**
Die neuesten Forschungen im Sobatgebiete. Von Brix Förster.

A note on this appeared in the last number of the *Journal.*

French Congo. *B.S.G. Lyon* **17** (1901): 270–281. ——
La région du Chari et la mission Gentil.

French West Africa. *Tour du Monde* **7** (1901): 193–288. **d'Ollone.**
La Mission Hostains-D'Ollone, de la Cote d'Ivoire au Soudan et à la Guinée. Par le Capitaine D'Ollone. *With Map and Illustrations.*

French West Africa. *Rev. G.* **49** (1901): 71–79. **Regelsperger.**
L'occupation des territories du Tchad; les missions Gentil et Joalland-Meynier. Par G. Regelsperger. *With Map.*

Kamerun. *Deutsch. Kolonialblatt* **12** (1901): 518–520. **Stein.**
Bericht über die Expedition des Freiherrn v. Stein.

On an expedition through the uninhabited zone north and north-west of the lower Sanga.

Kamerun. *Mouvement G.* **18** (1901): 307–309. **[Wauters.]**
Dans le Sud Kamerun. *Sketch-map.*

Short account of journeys by M. William (cf. *Journal*, vol. xvii. p. 431).

Madagascar. *Rev. G.* **48** (1901): 471–484; **49** (1901): 27–44. **François.**
L'Émyrne industrielle, agricole et commerciale. Par G. François.

Madagascar. *B.G. Hist. et Descriptive* (1900): 177–209. **Saint-Yves.**
Quelques documents sur Madagascar au XVII^e siècle (1667–1671). Par M. G. Saint-Yves.
Madagascar en 1767 et 1768, d'après les papiers du gouverneur Dumas. Par le même.

Madagascar. *A travers le Monde, Tour du Monde* **7** (1901): 185–188. ——
Le canal des Pangalanes. *With Map and Illustrations.*

See note in Monthly Record, p. 89, *ante.*

NORTH AMERICA.

Alaska—Cape Nome. *J. School G.* 5 (1901): 1-16. ——
Cape Nome, Alaska. *With Map and Illustrations.*

Canada. *Miss. Catholiques* 33 (1901): 224-226, 231-234, 246-249. **Grouard.**
Les Eldorados du Nord-Ouest Canadian. Excursion au Mackenzie et au Klondyke. Par Mgr. Grouard. *With Illustration.*

Canada—Newfoundland. *Quarterly Rev.* 194 (1901): 33-53. ——
The Newfoundland Question.

Mexico—Magnetic Observations. **Moreno y Anda.**
B. Observatorio Astron. Nac. Tacubaya 2 (1901): 216-294.
Resultados de las observaciones magnéticas practicadas en el Observatorio Astronómico Nacional de Tacubaya durante el año de 1896. Por M. Moreno y Anda.

Mexico—Oaxaca. *B. Observatorio Astron. Nac. Tacubaya* 2 (1901): 263-266. ——
Posición geográfica de la ciudad de Oaxaca.

Mexico—Tacubaya. **Moreno y Anda.**
B. Observatorio Astron. Nac. Tacubaya 2 (1901): 267-285.
Datos para contribuir al estudio climatológico del Valle de México. La variabilidad interdiurna media de la temperatura en Tacubaya. Por M. Moreno y Anda.

United States—Adirondacks. **Beaumont.**
Tour du Monde 7 (1901): 301-312.
Aux Lacs Français des Adirondacks (États-Unis d'Amérique). Par Gaston Du Boscq de Beaumont. *With Illustrations.*

United States—California. *J. School G.* 5 (1901): 16-24. **Dodge.**
The Big Trees of California. By Richard E. Dodge. *With Illustrations.*

A movement has been set on foot for the preservation of the big trees by Government.

United States—Coast and Geodetic Survey. ——
Report of the Superintendent of the Coast and Geodetic Survey, showing the progress of the work from July 1, 1898, to June 30, 1899. Washington, 1800. Size 11½ × 9½, pp. 964. *Maps and Plates. Presented by the Survey.*

CENTRAL AND SOUTH AMERICA.

Andes. *Globus* 79 (1901): 373-375. **Hauthal.**
Ein Profil der argentinisch-chilenischen Cordillere. Von Rudolf Hauthal.

Andes. *C. Rd.* 132 (1901): 1296-1298. **Lapparent.**
Sur l'érosión régressive dans la Chaîne des Andes. Note de M. de Lapparent.

Argentine Republic. **Bernárdez.**
Manuel Bernárdez. De Buenos Aires al Iguazú. Crónicas de un viaje periodistico à Corrientes y Misiones. Buenos Aires, 1901. Size 11 × 7½, pp. xii. and 128. *Map and Illustrations. Presented by Dr. F. P. Moreno.*

A well-illustrated popular account of the route from Buenos Aires to the falls of the Iguazu, which the author holds to be the most wonderful natural phenomenon in the whole of America. The falls surpass Niagara in height by 40 feet in breadth by 2500 yards, and have the advantage also in their picturesque arrangement.

Argentine Republic. **Francisci.**
Argentina. Le Colonie Agricole nella Provincia di Cordoba. Rapporto del conte Odoardo Francisci. (R. Ministero Affari Esteri. Aprile, 1901.) Roma, 1901. Size 9 × 6½, pp. 30.

Argentine Republic. ——
Anuario de la Dirección General de Estadística, correspondiente al año 1899. Tomo II. Buenos Aires, 1900. Size 10½ × 7, pp. 484.

Bolivia—Meteorology. ——
Sociedad Geográfica de La Paz (Bolivia). Boletin del Observatorio Meteorológico. No. 4. Desde Agosto de 1899, hasta Marzo de 1901. La Paz, 1901. Size 8½ × 6, pp. 84.

Brazil. *American J. Sci.* 12 (1901): 18–32. **Derby.**
Manganese Ore Deposits of the Queluz (Lafayette) District, Minas Geraes, Brazil. By O. A. Derby.

British Guiana. **Cameron.**
British Guiana. Report for 1899–1900. Colonial Reports, Annual No. 318, 1901. Size 10 × 6, pp. 28. *Price 2d.*

British West Indies. *J.S. Arts* 49 (1901): 537–545. **Lubbock.**
The British West Indies. By Sir Nevile Lubbock, K.C.M.G.

AUSTRALASIA AND PACIFIC ISLANDS.

Australasia. **Coghlan.**
A Statistical Account of the Seven Colonies of Australasia, 1899–1900. By T. A. Coghlan. Sydney, 1900. Size 9 × 5½, pp. 836. *Map. Presented by the Agent-General for New South Wales.*

Australia—Directory. ——
Supplement, 1900, Relating to the Australia Directory, vol. i., ninth Edition, 1897. Corrected to November 15, 1900. London: J. D. Potter, 1900. Size 9½ × 6, pp. 32. *Price 6d. Presented by the Hydrographer, Admiralty.*

Australia—Year-Book. ——
The Year-book of Australia for 1901. London: Paul & Co. Size 9 × 5½, pp. 840. *Maps. Price 10s. 6d. Presented by the Agent-General for New South Wales.*

Caroline Islands. *Kolon. Z.* 2 (1901): 96–97, 122–125. **Pauli.**
Erlebnisse und Eindrücke des ersten deutschen Ansiedlers in Ponape. Von C. F. G. Pauli. *With Illustrations.*

Fiji. **Finucane.**
The Islands and People of Fiji. By Morgan I. Finucane. (Read before the Royal Geographical Society of Liverpool, March 21, 1901.) Size 8½ × 5½, pp. 24. *Presented by the Author.*

New Zealand. ——
Statistics of the Colony of New Zealand for the year 1899. Wellington, 1900. Size 13 × 8½, pp. xvi. and 530.

POLAR REGIONS.

Antarctic—Belgian Expedition. **Arçtowski.**
Aperçu sur les Observations Météorologiques de l'expédition Antarctique Belge. Par M. Henryk Arçtowski. (Sonderabdruck aus den Verhandlungen des VII. Internationalen Geographen-Kongresses in Berlin, 1899.) Berlin, 1900. Size 10 × 6½, pp. 648–651.

Antarctic—Climate. *Petermanns M.* 47 (1901): 128–132. **Supan.**
Das antarktische Klima. Von A. Supan.

Antarctic—Meteorology. *J. School G.* 5 (1901): 161–170. **Hubbard.**
The Meteorological Conditions of the South Polar Regions. By George D. Hubbard.

Arctic. **Abruzzi.**
The Voyage of the *Polar Star*. By His Royal Highness the Duke of the Abruzzi. (From the *Pall Mall Magazine*, June, 1901, pp. 255–266.) Size 9½ × 6½. *Map and Illustrations.*

Arctic. **Cagni.**
The Voyage of the *Polar Star*. Nearest the Pole. Commander Cagni's own account of his hazardous Journey. (From the *Pall Mall Magazine*, July, 1901, pp. 399–416.) Size 9½ × 6½. *Map and Illustrations.*

MATHEMATICAL GEOGRAPHY.

Cartography. *M. Militär-G.I.* 20 (1900): 191–193. **Burian.**
Combinierter Umdruck einer Farbenkarte. Von Johann Burian. *With Map.*

Cartography. *M. Militär-G.I.* 20 (1900): 179–190. **Hübl.**
Beiträge zur Technik der Kartenerzeugung. IV. Die Aluminium-Druckplatte. Von Arthur Freiherrn von Hübl.

Cartography—Military Maps. **Heimbach and Hödlmoser.**
M. Militär-G.I. **20** (1900): 194–212.
Die Militär-Kartographie auf der Weltausstellung in Paris 1900, nach den Berichten von Wilhelm Heimbach und Carl Hödlmoser.

Cartography—Military Maps. *M. Militär-G.I.* **20** (1900): 122–157. **Steeb.**
Die Kriegskarten. Von Christian Ritter von Steeb. *With Maps.*

Compass Correction. **Johnson.**
Compass Correction. By Comr. H. M. W. P. Johnson. (Course of Papers, No. 71.) Shipmasters' Society, London. 1900. Size 8½ × 5½, pp. 35–46.

Geodesy. *M. Militär-G.I.* **20** (1900): 39–63. **Netuschill.**
Die astronomischen Gradmessungsarbeiten des k. u. k. militär-geographischen Institutes. Die Breiten- oder Polhöhen-Bestimmungen. Von Franz Netuschill.

Geodesy. *M. Militär-G.I.* **20** (1900): 64–95. **Weixler.**
Bearbeitung des trigonometrischen Gradmessungsnetzes für Zwecke der Landesvermessung. Von Adolf Weixler. *With Diagram.*

Map-Scales. *Petermanns M.* **47** (1901): 119–120. **Habenicht.**
Neue Methode zur Veranschaulichung der Kartenmassstäbe. Von H. Habenicht.

The writer illustrates the relation which exists between the scale of a map, the supposed height of the eye of the observer above the surface depicted, and its distance from the plane of projection.

Photographic Surveys. *M. Militär-G.I.* **20** (1900): 171–178. **Pichler.**
Die Thätigkeit der Photographie-Abtheilung in den letzten Jahren. Von Friedrich Pichler.

Survey. **Richardson.**
Survey.—Practical and Precise. By G. F. Richardson. Wellington, 1901. Size 8 × 5, pp. 4. *Presented by the Author.*

Urges the execution by New Zealand of a triangulation capable of being applied to the measurement of an arc of meridian.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Meteorology. **Berson and Baschin.**
Hauptfahrten Nr. 31. 16. Fahrt des Ballons "Phönix" (4. Frühfahrt) 9 Juni 1894. A. Fahrtbeschreibung, von A. Berson. B. Meteorologische Ergebnisse, von O. Baschin. (Sonder-Abdruck aus Wissenschaftliche Luftfahrten herausgegeben von Richard Assmann und Arthur Berson.) Braunschweig, 1900. Size 12½ × 9½, pp. 315–325. *Diagrams.*

Meteorology. **Berson and Baschin.**
Hauptfahrten Nr. 33, 34. Die Gleichzeitigen Fahrten vom 6 bis 7 Juli 1894. A. Fahrtbeschreibung, von A. Berson. B. Meteorologische Ergebnisse, von O. Baschin. (Sonder-Abdruck aus Wissenschaftliche Luftfahrten herausgegeben von Richard Assmann und Arthur Berson.) Braunschweig, 1900. Size 12½ × 9½, pp. 338–351. *Diagrams.*

Meteorology. *Climat* (1901): 84–87. **Durand-Gréville.**
The Prediction for a stated time of squalls and storms. By E. Durand-Gréville. *With Diagrams.*

Meteorology. **Gross and Baschin.**
Hauptfahrten Nr. 11. 5. Fahrt des Ballons "Humboldt" 19 April 1893. A. Fahrtbeschreibung von H. Gross. B. Meteorologische Ergebnisse, von O. Baschin. (Sonder-Abdruck aus Wissenschaftliche Luftfahrten herausgegeben von Richard Assmann und Arthur Berson.) Braunschweig, 1900. Size 12½ × 9½, pp. 113–129. *Diagrams and Illustrations.*

Meteorology. **Gross, Berson, and Baschin.**
Hauptfahrten Nr. 23. 11. Fahrt des Ballons "Phönix" (3. Fahrt mit Luftelektricitätsmessungen) 17 Februar 1894. A. Fahrtbeschreibung, von H. Gross. B. Meteorologische Ergebnisse von A. Berson. C. Die Luftelektrischen Messungen von O. Baschin. (Sonder-Abdruck aus Wissenschaftliche Luftfahrten herausgegeben von Richard Assmann und Arthur Berson.) Braunschweig, 1900. Size 12½ × 9½, pp. 236–255. *Diagrams.*

Meteorology—Auroras. *B.A.R. Sci. et Lettres Danemark* (1901): 115–118. **Paulsen.**

Communications préliminaires sur quelques travaux de la mission danoise à Utsjoki. Par Adam Paulsen.

On the observations of auroras in Northern Finland during the winter of 1900–1901.

Oceanography. *Petermanns M.* 47 (1901): 73–83, 97–106. **Hjort.**

Die Erste Nordmeerfahrt des norwegischen Fischereidampfers "Michael Sars" im Jahre 1900 unter Leitung von Johan Hjort. *With Maps, Profiles, and Illustrations.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Commerce. **Atkinson.**

"British Manufactures and the Policy of Unfettered Commerce," and "The Interdependence of Nations." By Edward Atkinson, LL.D. The former reprinted from the *Engineering Magazine*, April, 1901. Size 9½ × 6½, pp. 44.

The writer insists that in commercial matters the nations of the world have common interests, and deprecates the idea that a state of trade-war is the necessary result of modern competition.

Commerce. *Monthly Rev.* (1901): 68–85. **Bowles.**

The Rational Horizon of Falmouth. By G. Stewart Bowles.

The writer considers that the British Isles, by their geographical position, must always retain their importance as the chief centre of the world's trade. He says nothing of the enormous recent increase in the trade of Hamburg, Antwerp, and Rotterdam, nor does he show in what way the position of these ports is markedly less favourable than that of British ports.

Commerce. *Monthly Rev.* (1901): 50–67. **Taylor.**

A Century of Sea Commerce. By Benjamin Taylor.

Telegraph Cables. *Rev. G.* 49 (1901): 45–57. ——

La question des cables sous-marins. Par L. R. *With Map.*

On French cable projects.

BIOGRAPHY.

Carolus. **Conway.**

Joris Carolus, Discoverer of Edge Island. A forgotten Arctic Explorer. By Sir Martin Conway. (From the *Geographical Journal* for June, 1901.) Size 10 × 6½, pp. 10. *Charts.*

Garcie. *B.G. Hist. et Descriptive* (1900): 135–173. **Pawlowski.**

Les plus anciens hydrographes français.—Pierre Garcie, dit Ferrande, et ses imitateurs. Par M. A. Pawlowski.

The writer calls attention to a 'Petit Routier,' published anonymously before the well-known 'Grand Routier' of Garcie, but which he considers to be the work of the same author.

Hecquard. *B.G. Hist. et Descriptive* (1900): 278–283. **Cordier.**

Un précurseur: Hyacinthe Hecquard. Par M. H. Cordier.

Hecquard was commissioned in 1849 to explore the route from Grand Bassam to Segu and Timbuktu.

GENERAL.

Bibliography—Geology. ——

Geological Literature added to the Geological Society's Library during the year ended December 31, 1900. London: Geological Society, 1901. Size 9 × 5½, pp. 182. *Presented by the Geological Society.*

Congress. *Verh. Ges. Erdk. Berlin* 28 (1901): 295–325. **Kollm.**

Der XIII. Deutsche Geographentag in Breslau. Von Georg Kollm.

Educational. **Dodge.**

J. School G. 4 (1900): 121, 179, 212, 264, 295, 342; 5 (1901): 25, 95, 136, 172.

A School Course in Geography. By Richard E. Dodge.

Medical Geography. ———

Selections from Colonial Medical Reports for 1898 and 1899. Colonial Reports, Miscellaneous, No. 16, 1901. Size 9½ × 6, pp. 420. *Diagrams. Price* 1*s.* 10½*d.*

Orthography. ———

The Spelling of Native Geographical Names. Perth, 1901. Size 8½ × 5½, pp. 10.

Urges the advisability of the adoption of the R.G.S. system in Western Australia.

Place-names. *B.G. Hist. et Descriptive* (1900): 83–91. **Martonne.**

Sur la tophonymie naturelle des régions de haute montagne, en particulier sur les Karpates méridionales. Par M. E. de Martonne.

See note in September number (*ante*, p. 316).

Year-Book. **Wagner.**

Geographisches Jahrbuch. XXIII. Band, 1900 . . . herausgegeben von Hermann Wagner. Zweite Hälfte. Gotha: Justus Perthes, 1901. Size 8½ × 6, pp. 173–488.

The second part of the volume for 1900 has been somewhat delayed through the difficulty of obtaining reports on certain of the countries of Europe. Through the death of Dr. H. Schlichter the literature on the British Isles has not been dealt with. In addition to the section treating of the geography of Europe, there is a useful summary, by Dr. Sophus Ruge, of recent literature on mediæval geography, and another by Dr. F. Toula of that on structural geology.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES: Revised sheets published by the Director-General of the Ordnance Survey, Southampton; from August 1 to 31, 1901.

1-inch:—

Printed in colours, 183, 185, 186, 187, 189, 190, 191. 1*s. each.*

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XXXVII. 1, 5, 6, 8, 9, 10, 14, 16; XXXVIII. 1, 9, 14; XL. 9, 12; XLI. 9, 10; XLVII. 4; XLVIIA. 1. **Wiltshire,** LXII. 7, 8, 12; LXIII. 5, 9, 12, 15, 16; LXVI. 8, 12, 16; LXXI. 8; LXXII. 1, 4, 8, 10, 11, 12, 14, 15, 16; LXXIV. 2, 4; LXXV. 1; LXXVII. 1, 2, 3, 4, 5, 7, 11. 3*s. each.*

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(9 and 10), 15 (engraved). 1*s.* 6*d. each.*

This completes the publication of the 4-mile map of England and Wales.

County maps with roads printed in colour:—Bedfordshire, Cambridgeshire, Huntingdonshire, Northamptonshire, and Rutland; * Brecknockshire, Herefordshire, Montgomeryshire, and Radnorshire; Cheshire, Shropshire, Staffordshire, and Flintshire (Det.); Derbyshire, Nottinghamshire, and Leicestershire; Gloucestershire, Warwickshire, and Worcestershire; Lancashire; Buckinghamshire, Berkshire, Hertfordshire, Middlesex and London. 9*d. each.*

(E. Stanford, London Agent.)

England and Wales. **Bartholomew.**

Reduced Ordnance Survey of England and Wales. Scale 1 : 126,720 or 2 stat. miles to an inch. Sheet 32. Sussex: J. Bartholomew & Co., Edinburgh, 1901. *Price 2s. Presented by the Publisher.*

The area included in this sheet is from Redhill on the north to the coast on the south, and from about three miles west of Liphook on the west to a little beyond Pevensey on the east. As in the rest of the series, the relief is shown by a system of tinting and contours, in addition to which altitudes are also given in figures. Main roads are coloured brown, and water blue.

ASIA.

Yenisei River. **Vilkitzki.**

Atlas of the River Yenisei from its mouth to Yeniseisk, from surveys made by the expedition under the command of Lieut.-Col. Vilkitzki. Published at the Chief Hydrographic Department, Ministry of Marine, St. Petersburg, 1900. [In Russian.] *Presented by the Chief Hydrographic Department, St. Petersburg.*

Considerable interest has for years past been taken in the question of the possible commercial development of Central Siberia by means of its important waterways, and in particular by way of the Yenisei river. This interest is due in a great measure to the voyages of Captain Wiggins up this river *viâ* the northern shores of Europe, and has led to the Russian Government undertaking a thorough survey of the Yenisei, which was commenced in 1894 by the expedition under Colonel Vilkitzki, and the results of which are now well set forth in the excellent atlas just presented to this Society. The charts of which the atlas is composed are on the scale of 5 versts (3·31 stat. miles) to an inch, and show the whole course of the Yenisei from Golchika at its mouth to Yeniseisk. It consists altogether of nine sheets, some of which are double, and an index. Many soundings are laid down, and islands, sandbanks, and rocks are indicated, as well as the nature of the banks. Parts where the survey is incomplete are shown by a dotted line. In addition to the charts, there are five pages of letterpress, an interesting table giving the speed of the current of the river at different points, and other useful information.

AFRICA.

Congo Free State. **Lemaire.**

État Indépendant du Congo Mission scientifique du Ka-tanga. Lieut. Ch. Lemaire du 2e Regt. d'Artillerie, Chef de Mission, Mr. F. Michel, second de la mission. Mr. L. Questiaux, Prospector. Scale 1 : 1,000,000 or 15·7 stat. miles to an inch. 2 sheets. Falk Fils, Bruxelles.

This map consists of two sections, the first of which shows the route and the results of the surveys of the Belgian expedition under the command of Lieut. Lemaire from August 5, 1898, to March 2, 1900; and the second, the journey undertaken between March 24 and July 3, 1900. During the first of these two journeys Lieut. Lemaire and his party travelled from Lake Tanganyika in a south-westerly and westerly direction *viâ* Lake Mweru, to the upper waters of the Kasai and Lake Dilolo, following a course slightly to the north of the watershed between the Congo and Zambezi. Considerable detailed information was gained respecting the direction of the tributary rivers and streams forming the upper waters of these two rivers, which will render it necessary to modify our previous ideas in some respects, and to correct the map of this region. The second map commences at Lake Mweru, and illustrates Lieut. Lemaire's expedition to Lake Tanganyika, and thence down the Lualaba and upper Congo to

Stanley Ville, in the neighbourhood of Stanley falls. The places where observations for longitude were taken are indicated, and the method employed stated, and by means of a special symbol, those places where no astronomical observations were taken are clearly distinguished. By a somewhat remarkable omission, there is, however, nothing to show where the latitude was observed, nor does the map state upon what the route survey depends, nor what instruments were employed upon it. Numerous altitudes are given in metres, but here again it is not stated how they were observed, notwithstanding the fact that there is a note pointing out that the altitudes laid down on the map are somewhat too low, and giving the corrections for seven important places. The map is clearly drawn, and printed in colours. No attempt has been made to incorporate the work of previous explorers.

AMERICA.

Haïti. **Tippenhauer.**

Topographische und geologische Karte des Morne de la Selle, der Cul-de-Sac-Ebene und des Salzseengebietes, Insel Haïti. Gezeichnet von L. Gentil Tippenhauer. Scale 1 : 100,000 or 1·5 stat. mile to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1901, Taf. 13 und 14. Gotha: Justus Perthes. *Presented by the Publisher.*

United States. **U.S. Geological Survey.**

Geologic Atlas of the United States. Scale 1 : 125,000 or 1·8 stat. mile to an inch. Folios: Bristol, La Plata, Monterey, Menominee, Mother Lode District, Uvalde, Tintic, Colfax, Danville, Walsenburg, Huntington, Washington, Spanish Peaks. Department of the Interior, United States Geological Survey, Charles D. Walcott, Director, Washington, D.C. *Presented by the U.S. Geological Survey.*

As is the case with the other folios of the United States Geological Survey, each of the thirteen above-mentioned consist first of all of a few sheets of descriptive and explanatory text, and then of a "topographic sheet" of the area under consideration, giving only the topographical features and the more important names. After this follow several sheets showing the geological features by well-selected colours and symbols based upon the topographic sheet, and sheets of sections and diagrams. In addition to forming a part of a most important and extensive survey of the United States, each folio is complete in itself, and a careful perusal of any one of them, together with a comparison of the various sheets it contains, cannot fail to be extremely instructive to the student of geology and physical geography.

CHARTS.

Russian Charts. **Chief Hydrographic Department, Ministry of Marine, St. Petersburg.**

Charts and Plans published by the Chief Hydrographic Department, Ministry of Marine, St. Petersburg.

Black Sea and Sea of Azov.

No.

554. Plan of Odessa. Scale 420 feet to an inch. 1901.
563. Plan of Batum. Scale 280 feet to an inch. 1900.
1797. Coast of Crimea from Cape Khersonese to Cape Meganom. Scale 2 geo. miles to an inch. 1900.
1824. Black sea, east coast from Gelenjik to Psezuap. Scale 2 geo. miles to an inch. 1901.
556. Plan of Marinpol. Scale 1400 feet to an inch. 1901.

Arctic Ocean.

561. Murman coast, bay of Evanovski. Scale 1400 feet to an inch. 1901.
555. Plan of Bear island. Scale 8400 feet to an inch.

Gulf of Finland.

565. Plan of the harbour of Peterhof. Scale 63 feet to an inch. 1900.

North Pacific Ocean.

558. Entrance to River Amur. Scale 4·1 geo. miles to an inch. 1900.
564. Korea bay, entrance to the Yalu river. Scale 1 geo. mile to an inch. 1901.

U.S. Charts. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for August, and North Pacific Ocean for September, 1901. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

Mr. Devey has already added many photographs to the Society's
these which he has recently presented are specially welcome. The foll
of the subjects:—

(1–8) Massawa; (9) Group of women of various tribes of Eritrea; (10)
of Danakil men and women; (11) Assab—a Somali caravan; (12) Ass
palm trees; (13) Abyssinian musicians; (14) Abyssinian woman carryi
Abyssinian women porters; (16) Abyssinian weaving-loom; (17) Group
of Adua; (18) Adua—family of Bascia Gion; (19) Queen Taitu and K
(20) Maccala—funeral ceremony; (21) Troops entering the emperor's
day of the Mascal; (22) Ras Mangashia presiding at a tribunal; (23) R
on horseback; (24) Son and nephew of Ras Mangashia; (25) Ras Mang
(26) A country woman carrying child; (27) A girl; (28) An Axum n
An Amara family; (30) Graves of Italians at Coatit; (31) Sudanese
Shiek Aly Nurin, chief of the advance guard at the taking of Kassala;
from Habab; (34) Kamaran island—Lazaret, 1897; (35) Kamaran island-
building; (36) A runaway slave; (37–48) Views of Jedda; (49) *Albatro*
man-of-war, in Jedda roads; (50) The Kaaba viewed from Mount K
Haram, the holy place of Mekka; (52 and 53) Attending the praye
Kaaba; (54 and 55) Pilgrim's arrival at Mount Arafat; (56) The Muna
Mekka; pilgrimage to Seyid Memuniyé 12 miles distant; (57) East s
valley; (58) Mezdelfe pilgrims passing; (59) Another view of the Kaa
Omra; (61) West side of Muna valley; (62) The town of Medina;
The prophet's tomb ("the garden of purity"); (65) Town of Tari
near Mekka beneath which Mohammed would retire to meditate; (
Khadija, and other monuments; (68) Arafat on pilgrimage day, A.H.
(69) Departure of Armenian travellers from Van, 1892; (70) Hamidiyye
their sons returning from Constantinople, 1893, near Bayazid.

Portuguese East Africa—Barue Country.

Thirty Photographs of the Barue Country. By Lieut.-Colonel A. J. Ar
1900. *Presented by Lieut.-Colonel Arnold.*

These photographs were taken in the imperfectly known region of Po
Africa between the Zambezi and the Pungwe, and are of considerable in
are half-plate platinotypes, and many of them are extremely well taken.
ing is a list of the titles:—

(1) Barue hut showing stockade defence at Mungari; (2 and 3) Bre
roadside; (4) Bed of torrent at foot of the hills near Katandiga's kraal;
Mungari; (6) Porters marching in the bed of the Muira river; (7 & 8
Barue expedition in camp with hunting trophies; (9) Commandant and
Tambura with "boy;" (10) Mdaba with Makombe inside kraal, M
Makombe and indunas; (12 and 13) N'yaswimbo and Dundumura induna
with ivory for the King of Portugal; (14) Interpreter and servants of ex
Misongwe, kraal of N'Canga; (16) River Zambezi from Tambura; (17)
from Misongwe, 6 kilometres distant; (18) Porters resting; (19) View ac


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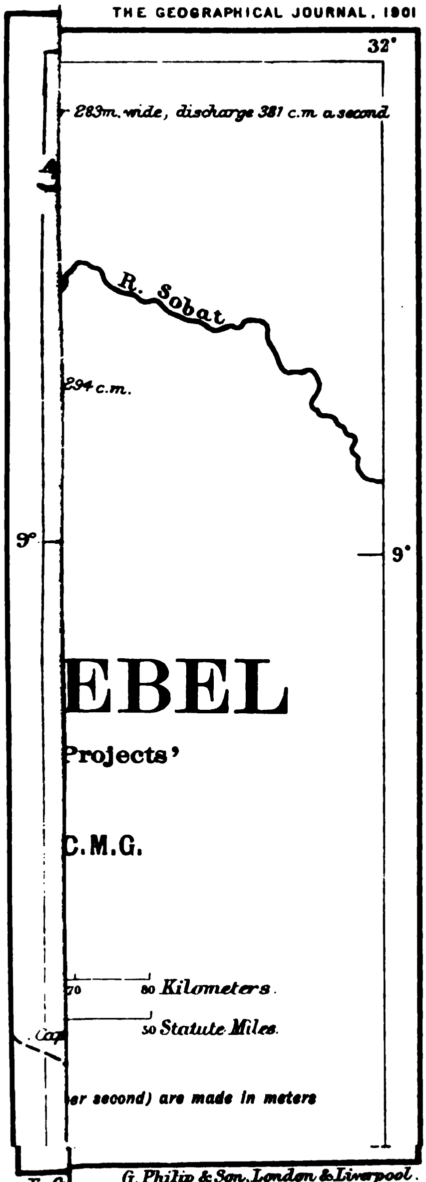
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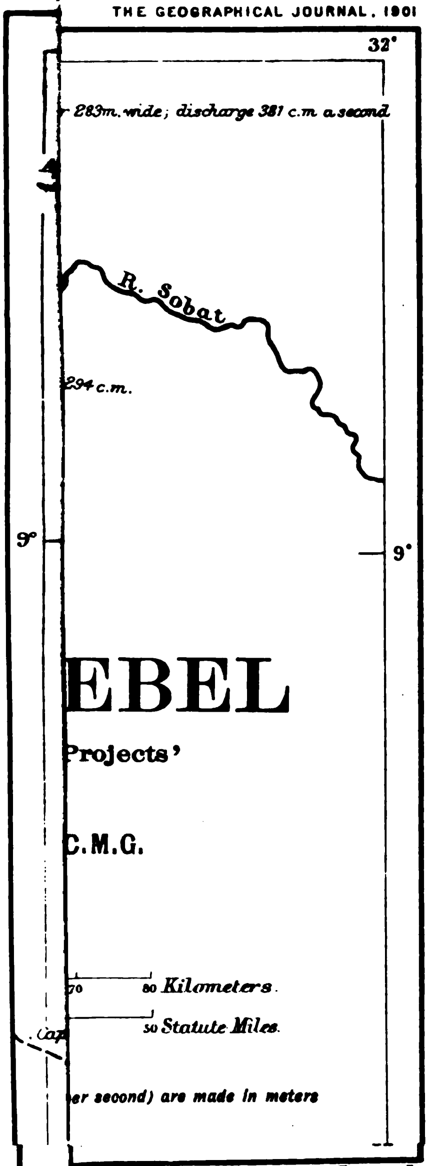
THE GEOGRAPHICAL JOURNAL. 1901



E. G.
G. Philip & Son, London & Liverpool.

The

Geographical Journal.

No. 5. NOVEMBER, 1901. Vol. XVIII.

ACROSS THE GREEN MOUNTAINS OF OMAN.

By Colonel S. B. MILES.

Jebel Akhdar, or the Green Mountain, as the Arabs call it, lies about 60 miles south-west of Muskat, and is the central and culminating point of the great chain forming the backbone of Oman. Viewed from the nearest part of the coast, some 40 miles away, this gigantic mass looms, a most conspicuous and majestic feature, in the distance, its dark precipitous front rising abruptly, cliff above cliff, in wild and desolate nakedness to a height of nearly 10,000 feet. The sight of the mountain is so impressive that from the moment I first saw it I made the determination to visit it, and the accounts I subsequently heard of its inhabitants and pensile gardens increased my desire to make its acquaintance. But the country at that period was very unsettled, tribal and dynastic wars being of perpetual occurrence, and it was not for several years that a fitting opportunity for carrying out my design presented itself.

In the middle of the year 1876 I found myself able to undertake the trip, and the Sultan having caused instructions to be despatched to the Governor of Nakhl to make arrangements with the Beni Riyam who possess Jebel Akhdar, and other tribes on the way, to provide an escort, I sailed from Muskat on June 27 in a native boat for Sib, where I landed and camped for the night in a garden near the shore. The next morning, having procured camels, I started in company with two sheikhs, who had come from Nakhl to meet me, for Burka, where I arrived about mid-day. After an interview with the governor and a short rest, we resumed our journey and struck inland in a direction almost due south, the path leading along the Wady Hammam.

We were now traversing the eastern part of the maritime plain

known as the Batina, which, except in the oases, is an uncultivated desert, the surface being in some parts sandy, in others stony. At 10 miles we came suddenly upon a small but rich oasis named El Wasit, near the junction of the Wadis Hammam and Maawal, where we experienced, in the cool and humid atmosphere of the date groves, a most refreshing change from the heat and glare. We now ascended the Wady Maawal, and, skirting the base of the Nakhl range, arrived, after another hour or so, at the village of Hibra, where we stopped for the night at the house of Sezzid Ali, a grand-nephew of the Sultan. The Wady Maawal is known in the upper part as Wady Mayin, and has several villages, viz. Jenab, Hibra, Afy, Musalmat, Wasit, etc. The Maawal tribe to which it belongs is Kahtanite, and numbers about twelve thousand souls. In the fifth or sixth century of our era this tribe began to assume a predominant position in the country, as the Julanda princes who then ruled over Oman belonged to a Maawal family, a circumstance which gave the tribe a status analogous to that held by the Âl Bu Saidis at the present day. The Julanda dynasty is supposed to be referred to in the Koran (Sura 18). It acquired great reputation in the Moslem world from the action of the brothers Abd and Jaifar, who reigned at Nezwa in the Time of Ignorance, and who accepted the new faith immediately on receipt of the prophet's letter of invitation, and championed it against the idolaters in Oman. The persecutions of Mowiya and Hejaj brought the dynasty to an end, and compelled the last of the line to seek safety in exile. The Maawal tribe was ever unfriendly towards H.H. Sezzid Turky, and was severely chastised in 1883 for their share in the attack on Muskat.

The following day we entered the ravine leading to the secluded glen where lay embosomed the town of Nakhl, or, as one may call it, for the three words have the same signification, Palmyra or Tadmor. The approach was one of striking and impressive singularity. We were now close under the lofty mass of Jebel Nakhl, which, rising abruptly, towered over us to a height of 5240 feet, and as we rode up the winding torrent bed, it seemed as if we were about to penetrate the very bowels of the mountain. No sign of human habitation, no cultivation, no gardens were visible, nothing but dark and desolate rocks met the eye; the silence was profound, and I was wondering where the town could possibly be, when from above, in front of us, several matchlocks were suddenly discharged in our direction, and I perceived a watch tower perched on a steep pinnacle 200 feet high, standing guard, as it were, over the entrance, and from which the sentries had fired to give notice of our approach. Rounding an angle, we were now confronted with the massive ramparts of the fortress, which, warned by the watch tower, immediately began to fire a salute from a battery of twelve-pounder iron guns, the sound of which reverberated sharply from the rocky walls of the glen. The town itself,

however, still remained invisible until, skirting the pinnacle, we passed under a two-arched viaduct, when the whole settlement, houses, palms, gardens, orchards, and cultivation, burst upon the view, presenting a scene of a very picturesque character. It was getting hot when we arrived, and though the sun poured its scorching beams upon the black rocks around us, and heated the air to an insufferable degree, I could not help stopping for some minutes to gaze upon the scene, and to admire the remarkable strength of the position.

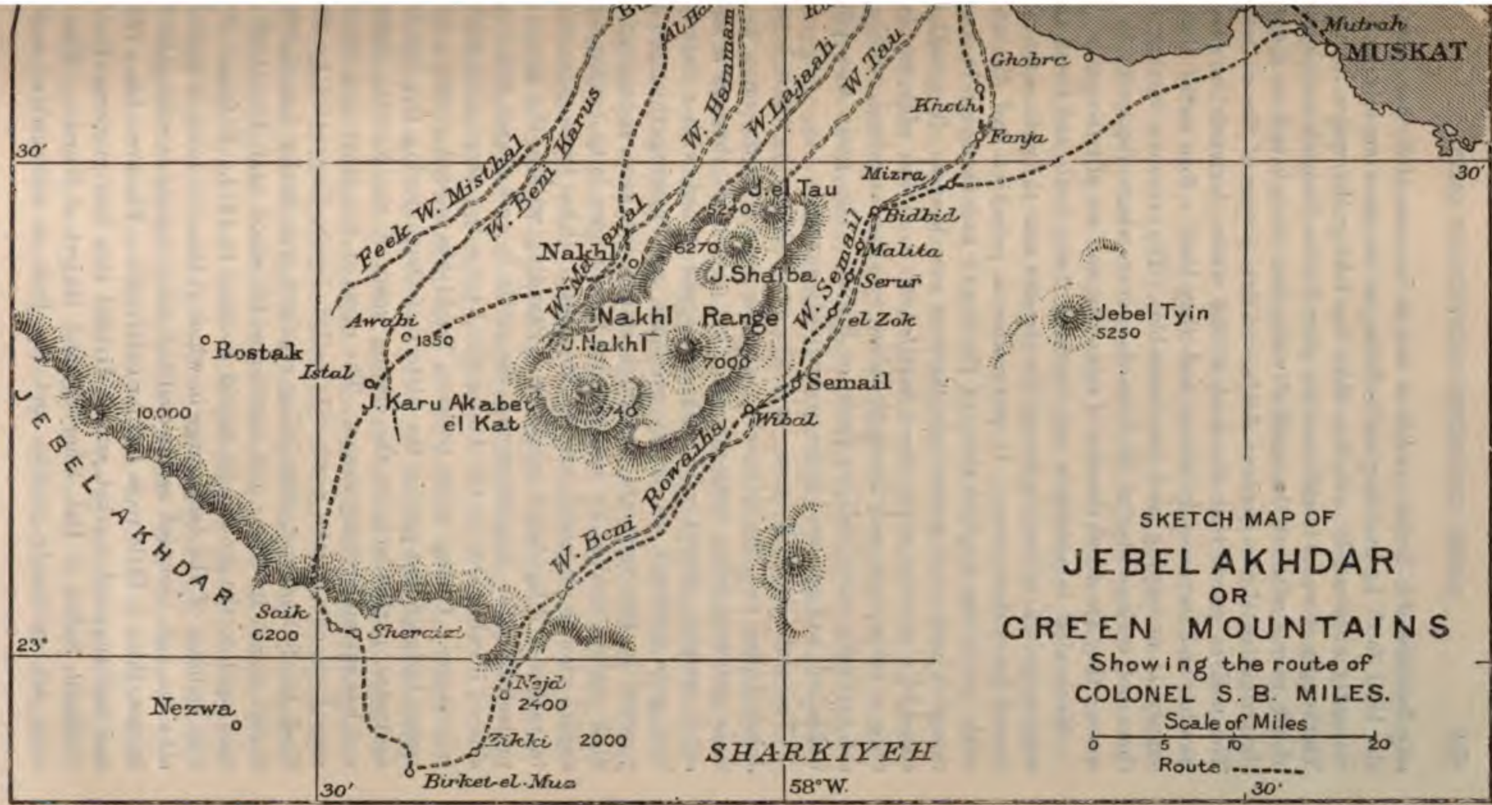
I was very cordially received by the Waly, or governor, Sezzid Salim bin Khalfan, who came down to meet me and conducted me to a small house in a pretty garden that had been prepared for me, and for the use of which I was indebted to the courtesy of one of the Sultan's officials. Here I was detained three days by the dilatory habits of the Arabs, and then, having received letters requiring my presence at Muskat, I returned thither by the shortest route. A week later, July 9, I started again, accompanied this time by Mr. Maguire, the B.I.S.N. Company's agent, and, taking a direct course, we made our first stage at the village of Halban, not far from Jebel Tau, the abutment of the Nakhl range, where we camped for the night. We found Halban a place of unusual industrial activity, the people being busily engaged in the manufacture of indigo dye from plants extensively cultivated in the neighbourhood. It is prepared in large earthen jars, and the dye is used to give the imported textile fabrics of Manchester that dark blue colour so highly favoured and almost exclusively worn by the women of Oman of all ranks and conditions. In the evening we inspected the village school, which was near our camp, and was held in the open air like an Indian pâtshâla, the sacred peepul being here represented by a large mango tree. The pedagogue was an old moolla, rod in hand, and among the twenty-one children sitting at his feet we counted five girls, one of whom was learning to write. Among the crowd of visitors that came to see us was the Sheikh of Al Tau, who pointed to his town in a west-south-westerly direction, and gave us a pressing invitation to visit it, saying it was three times as large as Halban. The next day, skirting the base of the mountain, we rode on to Nakhl, crossing numerous nullahs or ravines, and passing two villages, Farah and Lajaali, on the way.

The houses at Nakhl are built of sun-dried bricks or stones plastered over; many are high and spacious, and, though with but slender pretensions to architectural beauty, not destitute of exterior decoration. The lintels are often carved, and the doors ornamented and strengthened with pointed iron knobs or bosses. The windows are never glazed, but are closed at night with strong wooden shutters, and are sometimes furnished with mashrabiyehs, sometimes protected by strong iron cross-bars. The interiors are badly planned; the stairs are narrow and steep, and the upper apartments long and narrow. Plaster or cloth

ceilings are not in vogue, but the teak beams and rafters are often handsomely carved or painted in various devices. The windows are usually placed very low, so that the occupants reclining on the floor may look out of them, and at the top of the room circular holes in the wall serve to assist ventilation. On the floor are carpets or mats and cushions, but other furniture is scarce, and tables and chairs, of course, not to be seen. Strong wooden brass-bound boxes are the receptacles for apparel and valuables; and round the room are ranged broad shelves, on which is displayed a quaint and wondrous assortment of cuckoo clocks and other timepieces, coffee-pots, china figures and ornaments, English and Indian toys, and a variety of other curios, highly valued by their owner. In this ardour for collecting, as well as in the style of house decoration, Persian taste is very perceptible. Most of the houses have a small garden attached.

A noticeable fact here, it may be observed, is the mixed character of the population. This comprises, besides Arabs, Persians, Negroes, and Zattut, a very large proportion of Bayâsir, a race supposed to have emigrated originally from Hadhramaut. The Bayâsir are an industrious and peaceable folk, and many of them are wealthy, but are held as aliens by the tribal Arabs, and are never entrusted, I believe, with positions of authority and command. When a Bayâsir happens to meet a sheikh on the road he will not go up to kiss hands and give salutation without first dropping his sandals by the side of the path, after the manner of servants and inferiors.

Nakhl is abundantly supplied with water, and, indeed, one of the most characteristic features in its physical aspect is the existence of copious thermal springs, the medicinal virtues and efficacy of which are famous in the land. The chief fountain, or rather group of fountains, is called Hammam Thowâreh, and lies at the head of the ravine, a little distance from the town, among fragrant gardens and shady palms and mangoes. The sight is very curious. In the midst of a numerous family of smaller springs, the father of fountains gushes up out of a cavity in the ground, apparently about 6 feet in depth and 2 in diameter, and pours forth a volume of water, roughly calculated by me at 200 gallons per minute. This is the hottest, as well as the largest, spring at Nakhl, and has a temperature, I found, of 106° Fahr. There are at least twenty other springs in its vicinity, yielding altogether a very bountiful supply, but the temperature of those I tested did not exceed 104° Fahr. They are all tasteless and inodorous. On the other side of the town is a similar assemblage of springs called Hammam Odaisee, the most prolific of which issues from a hole in the rock and is led into a tank, from whence it flows to irrigate the fields. This spring was 105° Fahr., and another near it was 102° Fahr. Notwithstanding the high repute and universal belief in the curative properties of these waters, I did not observe, either here or at Thowâreh,


SKETCH MAP OF
JEBEL AKHDAR
OR
GREEN MOUNTAINS
Showing the route of
COLONEL S. B. MILES.
Scale of Miles
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Route
MUSKAT
Mutrah
Ghobre
Kheth
Fanja
Mizra
Bidbid
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Serur
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J. el Tau
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W. Semail
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Feek W. Misthal
W. Beni Rowaiha
Jebel Tyin
5250
Rostak
Istal
Awabi
1850
J. Karu Akabet el Kat
10,000
JEBEL AKHDAR
Saik
6200
Shereizi
Nejd
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Zikki
2000
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SHARKIYEH
30′
23°
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any facilities for bathing, such as are to be seen at Bosher, although the local faith is that hygienic effects can be more rapidly and permanently obtained by ablution than by taking the water internally. The supply of water is sufficient not only for the domestic requirements of the people without the need of wells, but enough and to spare for the irrigation of the gardens, fields, and date-groves of the settlement. The natives assert that the heat of the water decreases in summer weather and increases in winter, and they have a firm belief that the supply is unvarying and inexhaustible. The rivulets issuing from these hot springs abound in little fish, even where the water is still warm; they are about the size of minnows, and are of two species.

Mechanical ingenuity is not the forte of the Arab, and I was somewhat surprised to find, in one of the streams near the path, a flour-mill turned by water-power. It was rather a primitive and diminutive affair, but it was the first thing of the kind I had then seen in Arabia, though I have since noticed similar ones near Rostak. The mill consisted of a circular upper stone, bevelled up to a thin edge, revolving upon a stone floor, and attached below to a vortex wheel, which was set vertically with oblique floats or blades. The grain was put in unhusked, and appeared to be ground very slowly.

The castle is built on an eminence overlooking the town, between Jebel Laban and the pinnacle rock, the ascent up the ramp to the main gateway being very steep. This gate leads through a strong outer rampart pierced with embrasures and armed with a battery of iron guns mounted on rickety carriages, and, passing this, you find yourself in the courtyard, in which stands the keep, consisting of a high curtain flanked by two towers, from whose lofty battlements a superb view is presented towards the coast. It has three gates, and is in rather a dilapidated condition. Standing within the gorge and protected by the heights around, the castle is well placed, and is considered invulnerable by the Arabs, who have a deep sense of its military importance. Owing to its position, Nakhl has indeed played a by no means insignificant part in the history of Oman during the past three centuries, particularly in the closing years of the Yarebeh dynasty, and has sustained many sieges. The ruins of two other forts are to be seen here, one on the north side called Jeneb, dismantled by Sezzid Saed bin Sultan, and, after being repaired, was finally demolished by Sezzid Azzan in 1868; and another which stood near Thowâreh, and was razed to the ground by Sezzid Toorkee in 1874. Enfolded in the iron embraçe of the deep gorge in which it lies, the town is shut in on all sides, and, occupied as the confined space mainly is with palms and houses, there is little room left for cultivation. The town has a regular and well-supplied market, and is divided into five quarters, viz. Atik-Hadhain, Safrat el Ijal, Khoryeh, and Hujret el Kurein. The date trees are extremely prolific, and the fruit is esteemed of superior

sweetness and lusciousness—virtues which are ascribed by the people to the copious and constant irrigation of the plantations.

Out of a population of about 6000 the pure Arabs do not exceed 1500, representing the following tribes: Yaarebeh, Harrâs, Beni Kharus, Sereeriyin, Al Khozair, and Hadhârim. The number of fighting men is 800, mostly Bayâsir. In the lower classes there is much admixture of Persian blood. Each hâra or quarter of this town had a "sablah" of its own. This institution is very popular, and consists of a small shed, or covered platform, raised above the ground and open on all sides; it may be 15 or 20 feet square, with a light roof of mats and palm leaves resting on wooden posts. I have seen some, however, more substantially built, and bearing some resemblance to a mosque. Situated centrally in the village, it forms the council hall where the sheikhs and leading Arabs assemble daily to discuss local politics and chat over the events of the day. The tobacco-pipe of Turkey and Persia being almost unknown in Oman, the inevitable coffee-pot is in full requisition, and the sheikhs' slaves may be seen close by busily engaged in roasting, pounding and cooking the berry for the company.

There are numerous hand-looms at Nakhl, in which coloured lungies and puggrees are woven, as well as cotton cloth of the natural brown variety called "khodrung." The blue yarn required is dyed here, but the red and yellow yarns are imported from Bombay. Embroidered silk belts for ladies are also made here. Another industry is the production of porous earthen vessels for cooling water, the quantity made in the Nakhl factories being almost sufficient for the home demand. The clay used is a bluish marl, brought from the neighbouring village of Musalmât, mixed with sand. The kalib, or potter's wheel, has two discs, the lower one, which is called "raha," being turned by a treadle. The clay to be moulded is placed on the upper wheel, and is fashioned by an iron instrument called "moshal," the finishing touches being done with a sort of comb called a barit.

During my stay I visited some of the schools, of which there are five here, and saw the children imbibing instruction in the usual Moslem style, repeating aloud sentences of the Koran or rules of grammar read out by the mollah. They attend in the morning, and may be seen at an early hour hurrying to school, boys and girls together, some with a "minfa," or wooden Koran-stand, on their heads, some with a painted board or camel shoulder-blade, on which they learn to write, under their arm. The instruction given is of a very elementary character—reading, writing Arabic grammar, the Koran, and a little arithmetic being the only subjects. But the boys of the learned and wealthy are often educated at home by a mollah, and advanced further. The lack of method is partly compensated for by the precocity and tenacity of memory shown by the boys. Nakhl deserves attention for the comparatively advanced state of education

among the people, there being a larger proportion of persons in this town able to read and write than in any other in Oman. There is a good number, also, of professional scribes. Books, consequently, are not so scarce here as elsewhere. The higher position of learning here is attributed to the influence of the Persians, who occupied this part of the country during the time of Nadir Shah.

Nakhl has, for the greater part of the year, a temperate and pleasant climate, being preserved from the scorching winds that sweep over the great desert, and partly shaded from the sun's rays by the impending mass of mountains to the east and south. It is, moreover, cooled and refreshed by the sea-breeze from the coast; but we found from personal experience that the heat, though dry, could be sometimes stifling and oppressive in the extreme. The elevation, taking the mean of two aneroids, is 1100 feet.

On July 11 our kafeer, Sheikh Selim, having intimated that he had procured an escort, and that he was ready to conduct us to the foot of the pass, we mounted horses and left Nakhl at 3 a.m. the next day. Our route lay along the Rostak road, which, following the sweep of the range, led us west by south over a barren country with an intricate system of low hills, ridges, and ravines. Some of these ravines are inhabited by warlike tribes, and it may be convenient here to give the names of these ravines as they occur in succession from Sib westward. The first of them is the Wady Tau; the second is the Wady Lajaali, also called Wady Halban, and having its exit at Romais; and the third is the Wady Hammam, or Nakhl, which joins the Wady Maawal, and reaches the sea at Al Harâdi. The fourth river, the Wady Beni Kharus, becomes a confluent in its lower course with the Wady Misthal, and flows into the sea at Bu Abâli. The Wady Misthal belongs chiefly to the Beni Riyam, who occupy Fik and three other villages.

Soon after leaving Nakhl we pass to our left Towye, a hamlet lying at the foot of the Akabet el Kat, a rugged way, little better than a goat track, but the only one over the range to the Semail valley. At 8 a.m. we reached Felej el Khosair, in the Wady Beni Kharus, where we dismount for breakfast, while the sheikh trots on to Awabi to make various arrangements. This little dell is highly cultivated, and produces an abundance of fruit and vegetables. The fragrance pervading the air from the shrubs and sweet-scented herbs was very pleasant and enjoyable.

Leaving Felej el Khosair at 4 p.m., we rode on for two hours till we came to Towye Saib, a hamlet of the Dahaul Arabs, where the ravine suddenly expands into a small plain three-fourths of a mile in extent, and a mile beyond this we reach El Awabi, where we halt. The wady here turns sharp to the left through a deep and narrow defile, and at this point on the left bank, completely commanding the passage, stands

the castle Bait Awabi, in a position of great natural strength. Commanding the most accessible pass up Jebel Akhdar on the north, this fort has ever been a bone of contention between rival chiefs and factions. In particular it forms a constant source of trouble and hostility between the Ibriyin and Beni Riyam tribes, the former holding possession of it, while the latter would like to destroy it. Shortly before my visit the fort had been attacked by the Beni Riyam, who had mauled it very considerably, without, however, effecting a capture. One of the towers, I noticed, had been almost levelled to the ground. At one time the Ibriyin, fearing a strong coalition against themselves, offered Bait Awabi to the sultan, Sezzid Turky, who declined it. Subsequently His Highness changed his mind and asked for it, but in the mean time the tribe had changed their minds, and refused to give it up. It was eventually purchased by the sultan for a large sum, and the transit dues, which had been previously levied by the Ibriyin on goods passing through the defile, were then abolished.

Awabi lies about halfway between Nakhl and Rostak. The settlement covers a fairly large area, and every available spot has been reclaimed for tillage. The wheat and jowari had just been reaped, but other crops were still standing, and the fields, kept neat and regular, bore witness to industry and good husbandry. Stall-fed cattle of the small humpbacked kind are numerous, and almost every house appeared to have a cow or two. They are fed on barley, dates, and lucerne; and, though there is plenty of coarse grass, they are not allowed to roam about the hills. Awabi has a population of about 2000, with a fighting strength of nearly 400. It is occupied by three tribes, viz. the Beni Kharus, Ibriyin, and El Harras, who appear to dwell together amicably. The headman of the town, Sheikh Jabir, was very attentive and obliging, but was not very communicative. He was much depressed by the chastisement recently inflicted on his people by the Beni Riyam, and pointed out to me, sadly, the havoc they had committed among the date palms, the prostrate trunks of which were lying about in hundreds.

The shoran or bastard saffron plant grows plentifully in these hills, and the dried flowers are used by the women, who generally go about unveiled, to daub their own and children's faces with. It stains the skin yellow, and does not improve their appearance, though perhaps they think otherwise. The ladies who can afford it employ true saffron for the same purpose.

The preparation of dried dates, known in Oman as "bisr," and in India as "kharak," is carried on largely at Awabi, and as the season had now commenced, I took the opportunity to observe the process, and was taken round the factories by the sheikh. The dates selected are almost exclusively of the "Mubsili" and "Khanaizi" varieties, and are picked before they are quite ripe. The factory had a chimney about 15 feet high, and contained several open, circular, copper boilers,

capable of holding five gallons each, and nearly full of water. Into these vessels the dates are put, and allowed to simmer over a slow fire. As the water in the copper decreased from evaporation, it was filled up again, but it gradually became inspissated by the extraction of the juice of the date. The fruit is left in the water about half an hour, and is then taken out and spread on mats or cloths in the sun to dry, after which it becomes hard and of a pale red colour. It is exported in large quantities from Muskat to India. We were here transferred to a new escort, part of our old one returning hence to Nakhl, and camels were here substituted for horses, as being better suited for rough hill work, and the gradient between this and the next stage being very severe.

After leaving Awabi, the elevation of which is 1850 feet, the next morning we were led past the fort in a direction generally tending south-west, the tortuous ravine gradually narrowing to a cleft with perpendicular sides 600 to 800 feet high, and though evidently swept occasionally by impetuous torrents, pleasantly fringed, and adorned in places with rhamnus, tamarisk, oleander, asclepias, and other trees and shrubs that have clung tenaciously to the ground and withstood the rushing waters. At two and a half hours, 6 miles from Awabi, we come to Istâl, a village of the Beni Kharus; and a little further on a heap of ruins on the right bank above us, indicating the site of an ancient castle, named Hisn Salut, is pointed out. This fortlet, which was finally destroyed less than half a century ago, in one of the many tribal wars for the possession of this defile, had a chequered history, and as we passed it the Arabs of my party had a lively discussion on bygone events associated with it. The formation, as disclosed by the Wady Beni Kharus, appeared to consist, at first, of an argillaceous slate, giving place, as we ascended, to a dark sandstone variegated with reddish or brown streaks, the stratification being sometimes confused and dipped at great angles, sometimes crumpled by pressure, and apparently metamorphic.

Opposite the village of Istâl is a curious high ridge with a serrated crest, called Ikhbal. Above this the structure changes, limestone predominates, and a pleasing transformation takes place in the scenery, the hills assuming a verdant appearance that was denied to the lower slopes. In this part of Oman many of the wadies are cut through conglomerate, which usually forms the bed, and the Wady Beni Kharus is no exception to this rule.

Between Istâl and Aleya we passed six small hamlets occupied by shepherds and mixed tribes, owning large flocks of goats. At Aleya, where the aneroid barometers showed an altitude of 2400 feet, we dismounted and halted in order to begin the real ascent of the mountain about nightfall, the sun's rays at this season of the year forbidding any attempt at alpine climbing in the heat of the day. It was destined,

however, that I should traverse the mountain alone, as during the afternoon a kosid arrived with the post-bag, and my companion received letters recalling him to Muskat on business. He was accordingly obliged to relinquish the design of coming with me any further, and it was arranged he should return to Muskat the next day. The rugged conformation of the mountain sides here is picturesque, but the area available for cultivation is very limited, for the space is confined by the intersecting ravines that furrow the slope.

As may be naturally supposed, the ground has not been reclaimed without considerable difficulty and labour, the inequalities of the surface in some places necessitating the fields and orchards being raised and banked up. The soil is very fertile, and the earth is merely scratched by the plough, which is small, light, and simple. I saw a man turning up the stubble with a plough drawn by a single bull. The ears of corn are cut off close, and are threshed with flails made of date-stalks. Fruit grows here in profusion, and we noticed the citron, vine, lime, orange, and other kinds. A few coffee plants may be seen here, and it is the only place in Oman where it still lingers, the flourishing plantations that formerly existed having now all disappeared.

The sheikh informed me in the evening that he had made an arrangement with the owner of six asses, just arrived from above, to take us to Nezwa for fifty dollars, and to this I willingly agreed; but as six animals were not nearly sufficient for our requirements, and as no others were procurable, we had to hire porters to carry up the rest of the baggage. The sturdy Arabs who are accustomed to do this work, carry the burden on their backs in a net supported by a band or rope across the forehead, and seem to think little of their performances.

It was a little after-midnight on the 13th that, after taking leave of my companion and of the sheikhs who had so obligingly conducted us thus far on the journey from Nakhl, I commenced the ascent of the Akabat el Hajar or Lhojar, as it is popularly termed. It was quite dark as we began the ascent of the precipitous mountain in front of us, up a rugged watercourse, and I wondered how the Arabs could see their way along the narrow path. At times we had a stiff climb, and zigzagged up the acclivity at a perilous angle; at other times the track was less steep and easier. As we leave the torrent bed and continue to progress upward, the gradient becomes much more formidable, and the mountain now presents sheer perpendicular cliffs and bold buttresses. The path would be here quite impassable for beasts of burden had it not been artificially improved by the construction of successive series of rough steps formed of huge slabs of stone, and by the curbing and revetting up of the road in parts where it overhangs a precipice. The stupendous nature and difficulty of the work and the skill and enormous labour bestowed on it claimed my wonder and admiration, but it was in vain that I endeavoured to gather any local tradition respecting

its origin. The absence of tradition and the character of the work led me to regard it as of Persian conception and execution. A scattered Arab tribe like the Beni Riyam, always at war with its neighbours, could not have done it, and I think the most probable period to which it can be assigned is that of the Dailemite conquest of Oman in the tenth century of our era.

We found the asses we had hired of the hillmen to be surprisingly strong and sturdy animals; they were as surefooted as mules, and so active that they performed the ascent, a toilsome climb of 5000 feet, in five hours without exhibiting much fatigue. Unlike any others I had seen, these creatures were more stoutly built and much more spirited than their humble kindred of the plains. Their owners seem to treat them well, and do not, I believe, take them beyond the foot of the mountain. It is said that these asses are descendants of domesticated animals that have run loose in certain localities, three of which were mentioned to me; the asses in these colonies are probably in much the same half-wild state as the ponies in the New Forest and on Exmoor. Where the nature of the path permitted, the one I rode was accustomed to make short and rapid spurts, and then stop to regain breath. It was an impetuous, vicious little brute, always trying to bite somebody, and had acquired in consequence the name of Dheyaib, or the "Little Wolf." The saddles used are heavy and clumsy, and the load put on them appeared to be almost as much as a mule would carry. Owing to the sharp hard rim and deep cavity of its hoof, the ass is well fitted to climb rocky hills, and its value to the Arab in this mountainous region is great.

After about five hours of incessant toil, we reached the summit of the pass as the sun rose, and my weary party camped by the side of a little rill for two hours for rest and refreshment. I could have enjoyed a longer stay, as at some points it was possible to obtain a glorious panoramic view of wild and majestic scenery. We were here standing on one of the highest ridges of the mountain, and the escarpment, as it appeared to us, dropped almost perpendicularly from crag to crag, sheer to its base; the sea, though far distant, appearing from the dizzy height to be close under us. I found that one of my aneroids had given way during the ascent, but the other, graduated to 10,000 feet, was all right, and showed we had attained an altitude of nearly 8000 feet.

On resuming our journey, we descended for some distance a gradually shelving and undulating grassy plain with many large trees, which, however, were too far off to be recognized, and then came to a broad and verdant vale, which intersected our path and led away to the south-west. We saw a few shepherds tending their flocks in the distance, but the only wayfarers we met on the road were a party of women carrying bundles of grass on their heads for their cattle. After travelling in an east-south-east direction for 10 or 11 miles, we dismounted at a small

mosque and grove of trees by the wayside, and while resting here were joined by some of the sheikhs of Saik, Mohammed bin Saed and others, who had come out to welcome us and escort us to their town. The temperature at this spot at noon was 85° Fahr. in the shade, and there was an exhilarating and bracing freshness in the air truly delightful. From this point several high peaks were visible, but there was no village nor sign of human habitation near.

In the company of our new guides we now moved on again, and, passing on the way the spring and felej that supply Saik with water, we found ourselves, on turning a corner, suddenly brought to a stand on the very brink of a yawning chasm, dropping vertically to a depth of 400 feet below us, and effectually barring our progress. I looked about wonderingly, when the sheikh, taking me by the arm and pointing to a white village with a pretty green setting, lying in a sequestered nook at the foot of the cliff, said, "There is Saik; I will show you the way down to it." It was certainly the most singular situation for a settlement I ever beheld, and the mode of access to it was not less remarkable. Steps cut in the rock led to the bottom of the cliff, and down this long and slippery staircase my little steed tripped nimbly and steadily, but I was not sorry when we reached the ground. The whole community was there to receive us, and quarters were assigned to me in a small house that was vacant, while my party camped in an open space outside the village. This curious cluster of houses has a population of about four hundred, who subsist by growing corn and fruit, and exchanging their surplus produce for dates, cloth, hardware, etc., for they have no manufactures. They have many wells, and have also a small felej to irrigate their vineyards, fields, and orchards.

The cereals are wheat and jowaree, and two crops are gathered in the year. The rose, myrtle, and jasmin luxuriate in the gardens. Strong but rude trellises support the vines, which were still very abundant, though they were said to have much decreased of late years from blight or phylloxera. This misfortune is attributed by the natives to the machinations of an Afghan, who, about twenty years previously, had endeavoured to preserve grapes by adopting the Kabul method of packing the fruit in cotton-wool. A consignment was sent to the Zanzibar market, but the venture did not prove a success, and the attempt to start a trade in boxed grapes was abandoned. A year or two later the vines happened to be attacked by disease, and the people sagely concluded that the Afghan had cursed their vineyards after the failure of his speculation.

After receiving and dismissing a crowd of visitors, I went in the afternoon to pay a return visit to Sheikhs Nasir and Suliman, sons of the old temeemeh or chieftain of the Beni Riyam, Saif bin Suliman, by whom I was cordially received and regaled with coffee and conversation. They took me over their house, which, though the largest in

Saik, is an unpretentious structure, two stories high, built, like the rest of the houses at Saik, of stone cemented with yellow clay, and surrounded by a pleasant orchard and garden. I had hardly returned to my cottage, after visiting the sheikhs and taking a walk through the town, when a violent thunderstorm with hail and heavy rain burst upon us and lasted for some time. The rain on the rocky plateau above soon concentrated in the watercourses, and the tumultuous cascades that began to tumble down the steep walls of the chasm afforded a fine spectacle. The people informed me they had already had several smart showers, and that there was generally a fair amount of rain during the monsoon.

At 4 p.m. to-day the thermometer stood at 82° Fahr., at 6 p.m. it was 80°, and at 10 p.m. 74°. I found the elevation of Saik to be 6200 feet. The word Saik in Arabic signifies "a cleft or chasm."

This was the first point in the interior at which I had touched the route of Lieuts. Wellsted and Whitelock, and, having made inquiry as to whether there was any remembrance of their visit, I was gratified to meet with some who had personally witnessed their arrival forty-two years before. At my request, Sheikh Mohammed sent for two old men of the village and brought them to my cottage. I found that they retained a clear impression of the event, and their statements amusingly indicated how narrowly the strangers had been watched. The Arabs remembered that the officers had tents with them, used brass instruments to gaze at the sun, and spent much of their time in writing. Among other objects of wonder and curiosity, it had been noted that they possessed a bottle full of snakes.

The sheikhs of the Oman tribes have, in general, but little power over the other members in time of peace, but the temimeh of the Beni Riyam may be regarded as an exception, and he is indeed, from this and other causes, one of the most prominent sheikhs in the country. He is seldom on good terms with the Sultan of Muskat, and defiantly appropriates to his own use the produce of the Bait el Mal or crown lands, which belong of right to the ruler. In connection with this family, I am sorry to have to record one of those domestic tragedies so common in Arabia. Sheikh Nasir bin Saif died a few years after my visit, leaving three sons, the eldest of whom, Mohammed, inherited his father's position as temimeh. In 1886 Mohammed and his second brother were murdered by their uncle Suliman, who usurped authority and held it until 1899, when Nasir's third son retaliated and put his uncle Suliman to death.

The Beni Riyam occupy the towns of Sheraizi, Saik, Nezwa, Zikki, Birket el Muz, and Tanuf, and number about 17,000, of whom 3000 are fighting men. The tribe is Himyaritic and of Kamar origin, its eponymus being Riyam bin Nahfan bin Tobba bin Zaid bin Amr bin Hamdan. Their ancient domicile was in the province of Hamdan,

in the Yemen near Jebel Atwa, on the summit of which, where fire issued from the ground, was the temple of Riyam, a fane of great sanctity with idols of the sun and moon, and a great resort of pilgrims. According to the Arab geographer Hamdani, the ruins of this temple were still to be seen about the year 950 A.D. Tradition relates that the Beni Riyam emigrated in remote times from the Yemen, in company with their cousins the Mahra, and marched on to Oman, leaving the Mahra on the way, in the land they now occupy. After crossing the peninsula, the Beni Riyam were fortunate enough to secure as their new habitation a vantage-ground in the most inaccessible and central part of the country, and called the mountain, after the name of their old capital Radha, Jebel Radhwan, since changed, when or why I know not, to Jebel Akhdar. The fire temple seems to have passed out of the memory of the tribe, who now regard Radhwan as the name of an ancient prophet that arose among them. A portion of the tribe is said to derive its descent from Malik bin Fahm, who invaded Oman in the second century after Christ.

On the 14th I moved across to Sheraizi, which lies a mile to the eastward, and was received by the headman, Sheikh Salim bin Abdulla, whose present was a basket of peaches. The town is much larger than Saik, and offers a most striking contrast to it in the position it occupies. Though less quaint and romantic in appearance, Sheraizi is more favourably and finely situated, being perched near the head of a ravine, like an eagle's nest, on the brow of a lofty cliff which falls rapidly to the valley beneath, commanding an extensive prospect. The town is built on so steep a declivity that the houses appear to overhang one another, and the only communication is by means of narrow, dirty, irregular steps leading up and down from one row to another. The houses are small and mean-looking; they are constructed of stone, and are sometimes, but rarely, plastered with clay on the outside, as at Saik. Just under the town there is a copious spring of pure water, which gushes from the rock to fill a circular cistern, sufficing for the requirements of the inhabitants, and serving the conduits that fertilize the terraces below.

I spent most of the day in wandering about the place and examining the extensive hanging gardens which are spread along the precipitous valley walls and form the most interesting and beautiful characteristic feature at Sheraizi. To the left of the town, beneath it, and on the opposite slope of the valley, the whole face of the hillside, to the depth of 1000 feet or more, is cut into a parallel series of ledges or terraces, most symmetrically arranged and highly cultivated as vineyards, orchards, and cornfields. These curious pensile gardens, the like of which I had never seen before, with their varied foliage and ripening fruit, apricots, grapes, figs, and pomegranates, formed a very attractive and pleasing sight, and had evidently been most carefully constructed,

the terraces being stepped up with revetments wherever the natural features of the ground had not availed, to maintain the earth in position. Owing to the sharp angle of the slope, the ledges are in general very narrow, perhaps 10 or 12 feet in width, and considerable ingenuity has been displayed in their disposition and in overcoming the difficulties of the ground. The labour bestowed on them, however, would have been futile without an abundant supply of water, and in this respect nature has been prodigal, the cultivation being easily and perpetually irrigated by the numerous mountain streamlets, which are taught to meander from one ledge to another in turn, being confined by little embankments along the margin. Extensive as these terraces appear, the space they cover is not very large, and the inhabitants would be glad of more soil. The limited scope for tillage necessitates economy, and the corn may often be seen intergrown with leguminus, and sometimes even with melons and other cucurbitaceous plants.

Opposite the town, and on the other side of the intervening valley, which is called the Wady Miyadin, and flows to the south-south-east, is a conical hill with a ruined tower and mosque on the summit; and to the right, lying south-east by south, is El Jabul, a curious peak, which, I was told, was looked on as a potential stronghold, having served as a refuge for the tribe in old times. It is now untenanted, and no vestiges are left of ancient buildings. It is capable of easy defence, as the path leading up it is so steep, narrow, and rugged. The scenery of this valley, with its regular and richly varied terraces, like giant steps on the mountain-side, is as beautiful as it is extraordinary, and of a character of which it is impossible to give an adequate idea.

In the afternoon clouds again gathered round the peaks, and we had a pelting thunderstorm, which was very grand; the lightning was very vivid, and the cataracts of water seemed to gratify the Dailemites immensely.

The women here, and throughout the valleys of Jebel Akhdar, fetch water for domestic purposes in large copper vessels instead of in earthen jars, as in other parts of Oman. They also use copper cooking-pots almost exclusively, the employment of this metal being due, no doubt, to the difficulty of bringing earthenware up from the plains, and to the absence of clay in these mountains suitable for good pottery. The hillmen procure these vessels from Nezwa, where I afterwards found the manufacture of copper ware to be one of the principal industries.

During our ascent of the Akabet el Hajar to the plateau, the change in the character of the vegetation had been complete, marking the difference of elevation by the substitution of that of the temperate zone for the tropical and subtropical verdure of the plains. The plantain, the mango, and the stately date palm, which forms such a conspicuous feature in the scenery of Arabia north of the eighteenth parallel, and

which we last saw in the Wady Beni Kharus, have all disappeared, and in their place we have the walnut, pine, apple, and pomegranate. The fig, peach, apricot, vine, almond, and lime also flourish. M. Aucher Eloy mentions the cherry, but I did not observe it. The pomegranate is a handsome shrub, with dark green foliage and crimson flowers. It receives more attention at Sheraizi than any other product except the vine, and the fruit, though small in size, is of superior excellence. It forms the chief item of export from Jebel Akhdar, being shipped from Muskat to the value of 10,000 dollars annually for the Bombay market. The Arabs are very fond of the pomegranate, and employ it for making sherbet. The rind is very astringent, and is used medicinally as a febrifuge and anthelmintic. The terraces appeared to offer a peculiarly suitable site for growing coffee, and it was once extensively grown here, but from some cause the plantations failed, and the plant has now entirely disappeared.

I need hardly say that the assumption as to the nutmeg growing in these hills is erroneous, Wellsted's mistake having probably arisen from the name this spice bears in some European languages. Mace, the arillus or covering of the nutmeg, is another word indicating the belief prevalent in old times that Oman was the habitat of the spice, it being derived from Maceta, the appellation given to Cape Mussendom by the Greek geographers. Like so many other articles still bearing Arabic names, *e.g.* sugar, pepper, olibanum, rice, etc., the nutmeg was introduced into the Mediterranean by the Arabs.

The vineyards at Sheraizi are very extensive, and are regularly irrigated and manured. The vines are trained on rough trellises at certain distances, and produce both varieties of fruit, white and black. The grapes, which ripen here in August, were hanging in goodly bunches, and it did not seem to me that the people had any reason to complain of the crop, but they grumbled a good deal. Although much of the fruit may be eaten, and a portion made into raisins, there can be no doubt that the bulk of the crop is intended for the manufacture of wine of an inferior kind, which is entirely reserved, I believe, for home consumption. I did not, of course, witness the process, as it was too early in the season, and I had no opportunity of tasting the vintage, but I should imagine it, from the description I heard of the method employed, to be far from satisfactory. After crushing the grapes and mixing water with the whole mass of pulp, juice, skins, etc., they leave the liquid for about three weeks to ferment. The wine thus made is considered fit to drink in about three months after the fruit has been plucked. The wine thus made is consumed in the long winter evenings by the Sheraizi men, whose wine-bibbing propensities are notorious and reprobated throughout Oman. The Arabs of the interior, being a temperate and abstemious race, regard the constant manufacture of wine in their very midst by these Persians as a scandal

to their religion, and do not permit the production of spirituous liquor in any other part of the country, so far as I am aware.

Jebel Akhdar was explored botanically to some extent in 1836 by M. Aucher Eloy, the intrepid and indefatigable French naturalist, who ascended the mountain by the Akabet el Hajar, and returned to Muskat by the Wady Semail. In his zealous and enthusiastic search for plants, he traversed the greater part of his journey on foot with infinite toil, reaching the coast again at last enriched with many specimens of new species, but weary, fever-stricken, and footsore. In his journal, which was edited by M. Jaubert in 1838, he gives a graphic account of his sufferings and adventures. M. Aucher Eloy tells us he found many pretty flowers well suited for introduction into Europe; he collected about 250 species, and reckons there may be 500 altogether in Oman, an estimate which will, I suspect, be found much below the mark. In the vicinity of Nakhl the botanist found a tree of the genus Niehburia, and a very pretty flowering shrub, which he named *Vogelia leprosa*, also a beautiful new Dichyptera. The vegetation on Jebel Shaiba, the altitude of which is 6270 feet, was new to him. At El Hajar was a new Bœhravia, and at Aukaud a new violet, a new genus of primula, and a new species of Lunius, which he named *Aurea*. At the dispersion of M. Aucher Eloy's collection, the Kew Herbarium took 2600 specimens, and the British Museum 1907.

This mountain is estimated by Lieut. Wellsted to have a length of 30 miles from east to west, and an extreme breadth of 14 miles from north to south. The highest point visible from the sea was reckoned by the nautical surveyor at 9940 feet, but I have not been able to ascertain the local name of this peak with precision, some Arabs giving it as Jebel Hauz, some as Jebel Shum. The abruptness of the north and south sides render this grand rocky mass inaccessible from the plains, except by means of the torrent beds that ages of surface drainage and the waters of living springs have scored in its rugged flanks. Three of these natural highways leading to the summit can be travelled by animals with burdens, and form, consequently, the main passes. On the north side the Akabet el Hajar has been already mentioned as the one by which we ascended; the southern side offers two, the Wady Tanuf and the Wady Miyadin, the former being longer, but of the same character as the Wady Miyadin, which will be described further on. There is also, on the north side, the Akabet Fik, and on the south side the Akabet Shash, and perhaps others, but they are little better than goat-tracks. Eclipsed in height by a few peaks only, the northern flank of the mountain presents the most elevated ridge, and this feature is characteristic of the whole chain, which is much more lofty, abrupt, and precipitous throughout its length on its northern face than on its south flank towards the desert. The plateau declines gradually from north to south, and then falls rapidly to the plain in cliffs which, though wild

and striking, are less imposing in their grandeur than those on the seaward front. Owing to this conformation, the ravines thrown to the south by the watershed are the longest and most numerous, and drain off by the two great arteries, the Wady Miyadin and the Wady Tanuf, the bulk of the surface or rain-water that falls on the mountain. Among the tributaries received by the Wady Miyadin are the Wady Sarut and Wady Saik. The chief tributary of the Wady Tanuf is the precipitous Wady Beni Habib, in which are two villages, Ain and Akr.

To two or three only of the peaks visible from Sheraizi could the Arabs give names; they pointed out Jebel Hauz, a few miles to the south-west, and Jebel el Ham, a tall peak to the northward. Jebel Akhdar must have been very different at the distant period when it received the appellation, then, no doubt, an appropriate one, of "The Verdant Hill," from the drear and arid aspect it presents at the present day. Though immense masses of exposed rock, destitute of vegetation, give the mountain generally a savage and unattractive appearance, there are some parts that are well wooded, and the plateau we crossed had much long grass and herbage. Many of the deep ravines, moreover, are said to possess dense thickets of thorny undergrowth and euphorbia, and the extent of cultivation at Saik and Sheraizi strengthen the conjecture that the range in former days was better clothed with arboreal vegetation. The destruction, if it ever took place, of the forests that once covered the surface of the plateau, would have given full scope to the denuding power of the rain, and the long-continued effect of this would be to wash the fertile soil into the valleys below. This would prevent the renovation of the forests, and thus we have a bare landscape instead of a tract shaded by extensive woods. Again, the denudation of trees must have caused reciprocal action in reducing the rainfall.

If any useful minerals exist in Jebel Akhdar—and the only one I noticed was iron—they are little explored and utilized by the inhabitants, who devote themselves either to agriculture, in the case of townsmen, or to rearing animals. The bold and hardy shepherds, who are by their calling sprinkled about everywhere with their flocks, number several thousands, and form the chief fighting material of the tribe. Though so widely scattered, they assemble with great celerity and promptitude when summoned by the sheikhs for war.

There is a paucity of animal-life in these hills. Wolves, hyenas, wild goats, ibex, wild cat, and leopard are said to be found; but the last named, if existing at all, is very rare. Kites and vultures may be seen circling round in the sky, but other birds appeared to be scarce, both as regards species and individuals.

Almost from the commencement of the rise of the Arab empire in the seventh century, the possession of Omen was coveted by the khalifs, who regarded it as an integral portion of their dominions; but the people

of Oman never freely accepted this view, and preferred independence, holding that subjection to the central government merely meant the payment of a heavy tribute without any corresponding advantage. The result was that for three centuries Oman became the ever-recurring scene of sanguinary conflict and devastation, and was reduced to the position, except during some fitful intervals of repose, of a tributary province of the empire. But persistent as the efforts were to effect a complete subjugation of the land, there was one part, Jebel Akhdar, that long remained impregnable and defied successively the Khalifs Mowiya, Abbas, Harun, Motadhid and Mutti, whose troops overran all Oman, except this mountain stronghold, at the foot of which they surged and struggled, like angry waves against a rocky islet, in vain. The remarkable achievement of its capture was reserved for the Buwayid Malik of Fars, Adhad ul dowla. The uncle of this prince, Muiz ul dowla, had previously, in 354 H. (965 A.D.), invaded Oman, but hostilities had then been averted by the prompt submission of Nâfi the black, who, having murdered his master Eusof twelve years before, then held power with a Turkish guard. Nâfi was left in charge as governor, but was expelled soon after by a combined Carmathian and Omani force. This revolt was followed, in 355 H., by a second Buwayid invasion under Abul Faraj and Adhad ul dowla, who ravaged the country and brought it once more to obedience. In 362 H. (972 A.D.) the Buwayid army of occupation in Oman, which consisted partly of Persian and partly of negro troops, the latter numbering several thousands, broke out into open mutiny, and threw the country into anarchy. The news quickly reached Bagdad, but the Amir ul Oomra, Izz ul dowla, was powerless to take action in so distant a province, being himself at that time in a critical position, and his cousin, Adhad ul dowla, therefore, who had long wished to annex Oman to Fars, seized the opportunity to despatch a force from Siraf across the Persian Gulf to restore order. His general, Abul Harab, defeated the mutineers in three successive battles, and took possession of the country for his master. His treatment of the inhabitants, however, was so oppressive that they were soon in revolt against him. The national gathering was so strong that the newly elected Imam Sheikh Ward bin Ziyad and his deputy Sheikh Hafs bin Rashid were able to drive the intruders back to their ships.

For the moment Oman was again free, but the dark cloud of humiliation that followed this transient gleam of liberty was more calamitous than any previous one. Adhad ul Dowla met the disaster by sending an army under his wazeer Abul Kasim al Mathhad, powerful enough to crush all opposition. The fleet sailed first to Sohar, and then moved on to Kuryat, where the Imam Ward had concentrated the Arab tribes. On the plain between the sea and the Devil's Gap a great battle ensued, and the Arabs, worsted, but not subdued, retired up the Tyin valley, pursued by the enemy to Nezwa, where a second stand was made.

This conflict, more desperate and sanguinary than the first, resulted in the destruction of the Omani force. The Imam Ward was slain on the field, and the country fell prostrate at the feet of the victors. Jebel Akhdar alone remained intact, and in this mountain fastness the survivors now took refuge. No previous conqueror had ever ventured to attack these menacing and almost inaccessible heights, but the wazir Abul Kasim felt so elated and confident that he resolved to crown his work by storming and reducing this last citadel of the Arabs.

In two divisions, up the precipitous and rugged Wady Miyadin and Wady Tanuf, the Persians fought their way in face of the Arabs, who defended the mountain by hurling down rocks, slinging stones, and shooting arrows against their eager and relentless enemies. Step by step the Persians pushed on, and step by step the Arabs retreated, fighting desperately for many days. The summit was gained at last, and the final stake had then to be fought out in the open field. In this battle, which took place on a small plain called Sherif, above the Wady Beni Kharus, the Arabs are said to have numbered 10,000, but the Persian strength is not given. The struggle was long and bitterly contested, but the despairing valour of the Omanis could not prevail against the superior arms and training of their adversaries, who, after a terrific carnage, utterly vanquished them. The Arabs' cup of humiliation was now full, and Abul Kasim's conquest of the land was absolute and complete. The women and children of the Arabs became, of course, the spoils of the victors, and many of these Dailemites or Persians, attracted by the salubrity and fertility of the mountain, resolved to settle there, selecting for their new abode a village on the site of the present town of Sheraizi, which they renamed the "Little Shiraz," after the capital of Fars. As the Persian power waned before the Seljukian Turks, and as the Arabs recovered strength and freedom, the people of Sheraizi gradually became absorbed in the Beni Riyam tribe, of which they now form a distinct and dependent section. Though they have assimilated themselves to the Arabs, during the long period of their occupation, in language, dress, and habits, and are only to be distinguished by a somewhat fairer complexion and different physiognomy, it is evident they maintain themselves as a separate community and keep aloof as much as possible from the Arabs, seldom mingling, rarely intermarrying with them, and never descending into the plains. Though they are said to be a dissipated and depraved race, they are a peaceable and quiet folk. Their industry has been concentrated on agriculture, and the elaborate work of terraces, if not originally designed, has been at least vastly improved by them. It must not be forgotten, also, that they have conferred a benefit on the country by the introduction of many valuable fruits, as the pomegranate and the vine, the walnut and the peach, and the

almond and the mulberry, most of which were brought over from Persia after the Buwayid conquest in the tenth century of our era.

Not being prepossessed with the sour-visaged people of Sheraizi, and being pressed for time, I remained only one day here, and bid adieu early on the morning of the 15th. The descent of the precipice commenced immediately after leaving the town, and I rode down the declivity, passing on the way a few hardy plants which struggled for existence at the edges of the ravine, where they derived a scanty nourishment, until we reached, at about 1000 feet, the Wady Sarut, just under El Jebûl, which rises perpendicularly from the torrent bed to a considerable height. Another steep descent of some 2000 feet down the rough and stony bed, half choked with great boulders and fragments of rock, led us into the Wady Miyadin, and, following this, we came to a village called Musaira with a small plantation of date palms, the sight of which, at such a high elevation, was a surprise. Although this pass is less precipitous than, and does not bear comparison with, the Akabet el Hajar, it has required an almost equal amount of rough engineering work, and the steps have been most laboriously and ingeniously constructed. Riding down it was no easy matter, but my steed made his way along the slippery path with great steadiness. A small but perennial stream flows along the Wady Miyadin, fed by the springs issuing from crevices in the rock. These springs appeared to be more abundant in the higher parts of the mountain. On reaching the bottom of the pass, we experienced a hot simoon wind blowing strongly up the valley from the direction of the desert. The air was most oppressive and stifling, but the thermometer only indicated 110° Fahr.

The banks of the wady at this part exhibited chiefly a dark bluish, veined limestone and a very brittle ferruginous shale. Miyadin, where we stopped for coffee, is a pretty village under high cliffs, with a felej giving a bountiful supply of water, and many date, lime, and other fruit trees. The hot breath of the simoon was here suddenly changed into a cool and refreshing current of humid air, and to this succeeded a thunderstorm with heavy rain. At 1 p.m. we were again winding down the ravine, which now presented a more gentle declination towards the south. Three miles further we came to Misfa, a small hamlet, and here the banks of the wady begin to recede and to decrease in height, vegetation at the same time becoming more abundant, tamarisk, rhamnus, palm, and acacias fringing the bed. For two hours more we rode along the gradually opening valley until, emerging from the hills, we found ourselves upon a spacious plain, now parched and dried by the burning rays of a summer sun, and with the horizon unbroken save by distant clumps of palms. Here we suddenly changed our direction and turned to the east, arriving at length at the gate of a stone-built castle, where we knocked for entrance. This castle was

Bait Rudaida, the residence of Sezzid Hamad bin Hilal, a second cousin of H.H. Sezzid Turky, and an amiable and intelligent youth of sixteen, who welcomed me in the most friendly and hospitable manner.

I was accommodated at first, after the usual complimentary interview and coffee, in a little mosque within the castle precincts, until a room had been prepared for me upstairs, our arrival here having been entirely unexpected. In the mean time I had leisure to look round and see the castle, which is of similar size and style to Bait el Felej, near Muskat. Surrounded by an exterior wall which forms the courtyard, the Bait consists of a long rectangular structure, two stories high, protected by defensive towers at the angles, and enclosing an inner quadrangle open to the air. Inside the courtyard are quarters for the garrison, and in one corner is a small mosque. If well guarded, it could well resist an Arab force, unprovided with artillery; but it was at this time in sad want of repair. The cause of this was not difficult to discover, the young prince being a ward of the Muskat government, and little care being exercised to guard his interests and protect his revenues and property. At this time, however, the boy was in high favour with the Sultan, and had lately been presented with a small iron gun, of which he was immensely proud. Bait Rudaida is close to the town of Birket el Muz, or "Pool of Plantains," from which it is separated by a low conical hill, capped by a watch tower, placed there to command the water-supply. Around the town is an extensive date grove, intermingled with orchards and cultivation. The population is about 3000, and the settlement is divided into three hujrahs, or sections, one belonging to Sezzid Hamad, and the other two to the El Amair and Beni Riyam tribes respectively.

In the afternoon I walked over the Sezzid's estate with him, and then through the town, which owes its prosperity and extent to the fostering care and liberality of Sezzid Hilal, on whom it had been bestowed when a mere hamlet, as an appanage in addition to Sowaik, by Sezzid Sultan bin Ahmed. The fields produce the usual kinds of corn and vegetables grown in Oman, but were not so regular or well tilled as in most other parts. The product in which Sezzid Hamad seemed to take the keenest interest was sugar-cane, and he did not neglect to show me over his luxuriant plantations. He possessed a rude mill for extracting the juice, and made many inquiries as to the best method of refining sugar. The cane is propagated here, as in India, from cuttings, not from seed, and it is believed to have existed in Oman from time immemorial. Frequent and copious irrigation is necessary for the successful production of sugar-cane, and the Sezzid's fields were watered by a felej or subterranean stream drawn from the hills. The felej is a kind of artificial river, and is one of the most ingenious institutions for bringing water to stimulate the prodigal hand of nature that could possibly be conceived.

The hills abound in fountains, but the soil is so porous and thirsty, and the evaporation from the intense heat so rapid, that irrigation of the valleys and lowlands by any other method would be exceedingly difficult. The ground, though apparently arid and bare, is often fertile enough, and only requires water. Vivify it by irrigation, and it will yield an abundant harvest. The system is wonderfully well adapted to the country and to the economic condition and habits of the Arab. After the initial labour and cost, it requires but little trouble to keep it in repair, and the continual expense and toil of raising water to the surface from wells is avoided. The construction of these underground watercourses is generally undertaken by the tribal communities in each town or village on a sort of joint-stock basis, each individual contributing his quota in money or in personal labour. They are universal throughout Oman, and there are few villages without at least one of these felejes. From a spring at the base of a hill, which may be many miles distant, the villagers conduct the water to their fields through a tunnel or conduit below the surface in the following manner. A line of vertical cylindrical shafts, 4 or 5 feet in diameter and 100 to 150 feet apart, is first sunk between the spring and the village, and these shafts or pits are then connected together by a channel underground in such a way that the body of water, flowing by gravitation, reaches the surface as it approaches the cultivation. The felej is always commenced near the spring, where the shafts are deepest, and the work carried on to the point where the water is required for distribution.

The plan is, of course, more troublesome and expensive than an open irrigation canal, but it has the advantage—one of great importance in this parched and desiccated land—of avoiding loss by absorption and evaporation. In long felejes the upper shafts are often 30 or 40 feet deep, and in some cases the connecting channels are lined with masonry or brickwork. This, however, depends very much on the nature of the soil, a circumstance which also dictates the distance between the shafts. Near the villages the pits are frequently made accessible by steps or a sloped path, to enable the women to procure pure and cool water for domestic purposes. The rows of mounds formed by excavating these pits are a conspicuous and peculiar, though a rather unsightly, feature in an Oman landscape.

The upper apartments of the castle were high and spacious, but very modestly furnished, and not scrupulously clean. The ground floor was devoted to kitchens and storerooms. The place looked dismally bare and empty, comfortless and neglected, and bore the appearance of a house whose glory had departed. It had once been rich in articles of luxury, collected by its founder in the days of his prosperity, but these had all vanished. The work of confiscation and spoliation of Seyyid Hilal's estate was completed by the Metowa under the Azzan-Khalaili *régime* about 1869, but the Birket el Muz property was restored to

the rightful owner, Sezzid Hamad, as an act of justice by Sezzid Turky.

Round the room I occupied ran a broad wooden shelf, on which was ranged a miscellaneous gathering of lamps, clocks, china, medicine-bottles, etc., and among these curiosities was a dusty heap of Arabic manuscripts, of which I made a careful list. They were mostly religious works, and belonged, I found, to a learned Ibadhi Mulla, known as the Kazi, to whom had been entrusted the guardianship and education of Sezzid Hamad. This prince was devoid of political ambition. He never interfered, when he grew up, in the jealous intrigues and factious quarrels so rife among the chieftains of Oman, but led a quiet homely life, absorbed in books and country pleasures, until his retirement to East Africa, where he died in early manhood. His father, Sezzid Hilal bin Mohammed, of whose noble disposition and generous spirit some account was given by Lieut. Wellsted, was a notable personage in his day, and a warm friend of the English. He held a foremost place in general estimation as a member of the ruling family, and was regarded as a man fully worthy to guide the destinies of the nation had he been called to the throne. His memory was long cherished in the country, and seldom, I believe, has a man's death been more sincerely lamented in Oman than when Sezzid Hilal was treacherously murdered by his cousin Kais in 1864. The story of this tragedy was related to me as follows:—

About two years before the close of the reign of H.H. Sezzid Thowaini, who was murdered by his eldest son Salim in 1866, Sezzid Kais of Rostak formed a plot to destroy him and seize the government of Muskat himself. He communicated his plan to Sezzid Hilal, who was too prominent and influential a personage to be ignored, but the latter, having always been loyal to Sezzid Thowaini, indignantly refused to join, and denounced the plot. Sezzid Kais then determined to be revenged, but, failing to find an assassin, had to undertake the task himself. Approaching his cousin Hilal, who, unlike most men of his rank, seldom wore a sword, in an apparently friendly manner, Kais suddenly drew his sword and struck him savagely on the head. Staggered by the unexpected blow, Hilal recovered sufficiently to plunge his dagger into the bowels of his assailant, who fell dead. Hilal was removed to Sowaik, where he expired shortly after. The fort at Sowaik was then assaulted by the adherents of Kais, and, though gallantly defended by Hilal's sister, was captured and annexed to Rostak.

We managed to get the camels ready and make a start at six the next morning, though our courteous young host, Sezzid Hamad, was loth to let us depart, and insisted on accompanying us a good part of the way on horseback before he would take leave. Our road lay over a level plain dotted with acacia and scant herbage, and intersected by

shallow watercourses, the most considerable of which is the Wady Hajar, with a village of the same name. Two hours at a slow trot took us to Zikki, a large and important town on the banks of the Wady Halfain. The wali, or governor, Sheikh Mohammed bin Sinan, who at this time held the castle on behalf of the Sultan, came out to meet us, and received me very cordially. After coffee in a large subla inside the courtyard, the sheikh showed me all over the castle, and then, taking me to an upper apartment, informed me that he wished to give a general entertainment to the Arab escort. I was anxious to push on and cover another stage in the afternoon before halting for the night, but the sheikh was so earnest and persistent in offering hospitality, declaring that it would lower him in the eyes of his people to allow my party to pass his gate unfeasted, that I felt obliged to submit and acquiesce in his wish, though I knew from experience that on such occasions the culinary preparations demand deliberation, and that our day's march was at an end.

The town of Zikki has some beautiful plantations of palms and extensive cultivation, and stands in a very picturesque locality. It is divided by the Wady Halfain, and is supplied by one of the most copious springs of water I have seen in Oman. On the left bank the ground is low, fertile, and well tilled by its occupiers, the Beni Riyam. The right bank is much higher, and on this elevated site are built the castle and the walled quarter of the Beni Rowaiha. Outside the settlement are several watch towers and hamlets of the Âl Amair and other tribes. The population may be 8000, and is mainly composed of the two tribes mentioned, the Beni Riyam being by far the strongest. These tribes, locally known as "Yemen" and "Nizâr," live in a chronic state of antagonism and warfare with each other, ever vigilant against surprise, and ever ready for a skirmish, except in the short intervals of "salfa," or truce. The political relations of both tribes are somewhat confused, as the Yemenite Beni Riyam are now ranked as Ghaffirees, and the Maddic Beni Rowaiha as Hinawis.

The castle is a lofty structure, compact and massive, with walls about 5 feet thick. It was at this time scarcely a century old, having been built on the site of an ancient fort by Mohammed Jabri, maternal uncle of Sezzid Said bin Sultan, but it had an antiquated appearance from its battered and dilapidated condition, one tower having tumbled down bodily. Outside and in front of the castle were two mounted iron guns, old, honeycombed, and unsafe, but capable, as I can affirm, of making a prodigious noise, for they were fired as a salute on our arrival, and this is a quality of immeasurable value in a country where the use of artillery is so little known. The castle not only overawes the whole settlement, but, standing as it does in a commanding position at the head of the Semail valley, dominates and controls one of the chief highways and arteries of traffic. Its possession, therefore, has

always been regarded as a matter of military importance by the central government.

The Wady Halfain is a perennial stream for some distance from its source, and flows to the south-east, reaching the sea at Ghubbet Hashish. About halfway down its course it meets the Wady Kalbuh and Wady Andam, and its grassy bed, which is much frequented by the Bedouins for grazing their flocks, forms the natural road from Mahot to Adam. The elevation of Zikki is about 2000 feet.

The Waly Sheikh Mohammed had duly performed his promise of collecting fresh camels for us, and we were on our way again at daylight next morning. I was about to take leave of him, when he announced his intention of accompanying us part of the way, and from this resolve I could not dissuade him. He rode a handsome and fiery black Arab, and kindly offered me one of his stud, but I preferred a dromedary, as we had a stage of nearly fifty miles before us, and the camel is superior to the horse in speed and comfort on a protracted journey. With our faces towards the north, we found ourselves climbing a gentle acclivity to the crest of the mountain chain, along a rough and stony watercourse, the stupendous crags and precipitous cliffs of Jebel Akhdar rising in dark masses on our left hand, deeply furrowed by ravines and clefts, while to our right the ridge trended away east by north. An hour's ride brought us to the Nejd or summit of the chain, which is 400 feet higher than Zikki. Various names were assigned to this pass by different persons I spoke to, viz. Nejd Beni Rowaiha, Nejd Mujberriya, and Nejd Soharma, but they were all of one accord as to the Nejd being the lowest point of depression along the range. The watershed in this vicinity provides the source of two of the longest rivers in Oman, flowing in opposite directions, viz. the Wady Halfain, already described, and the Wady Beni Rowaiha, or Wady Semail. Crossing the ridge, we descended a stony ravine leading into the main bed of the Wady Beni Rowaiha, and we now saw, stretching out in front of us to the coast, the largest, most populous, and, politically, the most important valley in the land. This long, rich, and splendid valley, lying between two mountain ranges, forms one of the main channels of communication between the coast and the interior, and, though here and there barren, is studded along the banks of its ever-flowing river with a succession of towns and villages, bordered by palms and cornfields, orchards, gardens, and cultivation. Its aspect is much diversified, exhibiting at some places vegetation in great exuberance, while at times we rode over desolate tracts of sand and pebbles without a sign of house or tree. The ranges that form the flanks are somewhat irregular masses of varying height, soaring at some points to lofty peaks several thousand feet in altitude.

At one part the hills approach and contract the valley to a narrow passage, at another they retire to let it expand. Flowing in a generally

north-eastern direction, the Wady Semail is fed by innumerable springs and rivulets, and is swelled after rain by the tributary, but transient streams poured into it by the ravines and torrents. The volume of water that reaches the sea would, of course, be much more considerable were it not for the enormous quantity drained off by the inhabitants to irrigate their fields. The source of the river is in Jebel Akhdar, and the flow is tolerably fast, but without any sudden falls to Semail, from whence the descent is more slow and gradual. Computing the curves and windings, the entire length can hardly be less than 100 miles.

Passing from one fertile strip to another, and wading across the narrow bed of the stream many times in our winding path, we continued to sink more into the heart of the valley, which became more populous, cultivated, and attractive, as we advanced. After five hours' hard travelling we arrived at Wibal, where Sheikh Mohammed left us. He pressed me to stay the night, and I was half inclined to accept the invitation, as I felt rather fatigued, and would have liked the opportunity to see the place, but I decided to move on, and after making the usual presents to the sheikh, I took leave. Wibal stands on the left bank, under a conspicuous white hill surmounted by a watch tower. Behind it to the west rises the imposing Nakhl range, one of the peaks of which, called Jebel Karu Akabet el Kat, with a rugged pass close by leading to Rostak, has been estimated at 7000 feet.

For two hours more we trotted on in the fast-fading light, and it was nigh sunset as we approached the outskirts of the Semail Aliya, or Upper Semail, and began to pass through patches of cultivation and gardens, intermingled with the indistinct forms of houses and date-leaf huts. It was not easy to pick our way among the intricate network of irrigation channels and the labyrinth of palms, and thinking it better not to penetrate further, lest we should disturb and alarm the people by the sudden appearance of a mounted party in their midst at nightfall, we turned off to camp by the stream.

The Beni Rowaiha are the remnant of a renowned and noble tribe, the Beni Abs. Of the race of Adnan and the stock of Ghatafan, they claim descent from the Beni Hâshim, and on their first arrival in Oman called themselves the Beni Hâsham. The patronymic of the tribe seems to be Rawaha bin Rabia; they are, however, often still spoken of by other Arabs as the Wilad Abs. Though one of the most recent immigrants, having probably entered Oman after Mohammed, the Beni Rowaiha have gained possession of one of the best-watered valleys in the country, and now hold an influential position, being a powerful community of about eighteen thousand souls, peopling thirty villages. Surviving to some extent to this day—for the breach has never been completely healed—the feud between the Abs and Dhobyan had its origin in a quarrel about a horse-race in Nejd, in the sixth century of our era, and the war that then took place is known to fame as the

"War of Dâhis," the two tribes being at this time enemies and neighbours in Oman, as they were in Nejd 1400 years ago. The story of the War of Dâhis, which lasted for forty years, is a typical illustration of the internecine strife that occurs at intervals in Arab nomadic life, even at the present day. The details of it, as collected from many Arab poets and narrated by Fresnel and Caussin de Perceval, are very curious, but are too long for insertion here, and I can only give a bold outline.

In the year 562 A.D., the Sheikh of the Abs, Kais ibn Zohair, made a successful foray on the Thalaba tribe, and as a ransom for the booty and captives taken, demanded and received a famous horse named Dâhis. The extraordinary fleetness of Dâhis became the theme and boast of the tribe, and the envy of their neighbours, and it was not long before a match was made to race him with another horse. This was done by a cousin of Kais, who agreed with Sheikh Hamad bin Bedr of the Dhobyan tribe, to run Dâhis against a Fezara mare named Ghuba for a wager of ten camels over a course of fifty bow-shots. The match had been made entirely unknown to Kais, who, when informed, highly disapproved of it, and wished to withdraw, but eventually the wager was increased to a hundred camels, and the length of the course to a hundred bowshots. As the day fixed for the race approached, the horses were kept without water, the plan being that the horse which first plunged its nose into the water-trough 10 miles from the starting-point should be declared the winner. The racers were to run riderless, and to make them gallop their best, maddening thirst was to take the place of whip and spur. Over the yielding sandy plain the superior strength of Dâhis told, and he was soon well ahead of his rival the mare, which, though fleet, had less staying power. He would undoubtedly have won the race had it not been for a ruse of the Dhobyan Sheikh, who had concealed a man in a hollow in the course, with orders to check Dâhis and throw him off his stride. The trick succeeded, and Ghubra was first at the goal. Kais was informed of the stratagem by onlookers, and was beside himself with rage and vexation. As the race, however, had taken place in the country of the Dhobyan, he was powerless to do more than protest, and after vainly endeavouring to induce Sheikh Hamad to repair the injustice by restoring the wager, he returned home. The Abs were so hot and eager for revenge that the first blow was soon struck, and the first victim was a brother of Sheikh Hamad, who had acted so perfidiously. On this event hostilities would have ensued, of course, if the Abs had not immediately paid the Dhobyan the bloodwit of one hundred camels. Sheikh Hamad accepted this payment for his brother's death, but, after doing so, avenged himself by treacherously slaying a brother of Sheikh Kais.

In the war that now followed, the first battle, known as Dhul Marâkib, was a triumph for the Abs, but in the second the Abs were disastrously beaten, and obliged to give hostages. A long truce was

then concluded, at the termination of which, in the year 576 A.D., Sheikh Hamad, instead of restoring the hostages given by the Abs, foully murdered them.

The attack made by Sheikh Kais, directly he heard the news, was so sudden and furious that the Dhobyan were taken by surprise, and suffered a loss of twelve killed. After this the position of the Abs became so critical, for they were much inferior in strength to the Dhobyan, that they resolved to migrate. They were pursued by the Dhobyan, who were plundering the baggage, when the Abs, making a sudden onslaught, routed them with great slaughter, killing Sheikh Hamad bin Bedr, whose treachery had caused the war. After many wanderings and adventures, the Abs arrived at last in the territory of their old enemies, the Amir bin Saasaa, by whom they were kindly and hospitably received.

The Amir were at this time at feud with the Beni Temim, who had meanwhile allied themselves with the Dhobyan, and as war was now inevitable, the two coalitions collected their strength for the final struggle, the force put into the field by the Dhobyan and Temim tribes being, it is said, the largest ever assembled in Arabia. The Abs and Amir tribes retired to a precipitous defile called Shoab Jabala, where they awaited attack. The enemy, confident in numbers, attempted to storm the ravine, but were thrown into confusion by a device, and the Abs, rushing down, utterly routed and dispersed them. This famous fight took place in 579 A.D., and practically terminated the campaign, though the tribes continued a desultory war for about thirty years longer, when they were finally reconciled by mediation, and the Abs returned to their former abode. Sheikh Kais ibn Zohair, however, scorned to make peace with his enemies, the Dhobyan, and retired to Oman, where he turned Christian, and became a monk or recluse.

Such is the brief story as preserved in ancient poetry, but the oral tradition of the tribes has somewhat varied it in course of ages; for instance, many Arabs believe now that Dâhis was ridden by Sheikh Kais, and the mare Ghubra by Sheikh Hamad.

Early the next morning, July 17, I crossed the boundary and entered Semail Sifâla, or Lower Semail, where I was met and greeted by the Wali Sezzid Nasir, whose acquaintance I had made two years before at Soor. After coffee I informed him of my intention to proceed on to Muskat at once, and asked him to procure fresh camels without delay. To this he demurred, begging me to stay with him till the following day, and saying it was his duty to entertain my Arab following in proper style before he could let them depart. I did not relish the delay, but it was impossible to refuse the Sezzid's hospitable courtesy, and I therefore consented to the feast on condition that the camels were forthcoming by 1 p.m. Sezzid Nasir then led me to a summer abode in a small garden at the edge of the stream, where I was furnished with

the customary carpets and cushions, and where he left me to enjoy the luxury of a bath before breakfast.

The "Dayara," or circle of Semail, may be called the capital of the valley, as it contains the residence of the wali, a strong castle, and is the chief centre of population in it, being occupied by various tribes. It is, however, not a single compact town, but rather an aggregation of twelve adjoining, unwalled villages, with their plantations, fields, watch towers, and homesteads, forming, as a whole, a picturesque and luxuriant settlement, extending along the valley for 10 miles, with an average breadth of 1 mile. The names of the different villages composing the Dayara are—Semail Al Hajir, Ghobra, Harras, Zok, Mizra, Sital, Jemmar, Bistan, Sifeh, Jebeliya, Dubk, and Sil el Saheileh. These are divided into two nearly equal parts, known as Upper and Lower Semail, the former being held by the Beni Rowaiha and other Hinawi tribes, and the latter by the Ghaffiris. The castle stands in Upper Semail. The boundary-line separating these two hostile camps is sharply defined by a small transverse ditch called Sherkat el Haida, and across this ditch many a fight has taken place, for the tribes are constantly quarrelling and skirmishing. In these little affairs the combatants usually commence operations by firing at each other across the Sherkat from behind cover, and then, heated with the fray and stung to fury by the taunts of their adversaries, engage at close quarters, using their long double-edged Omani swords with great effect. Sometimes, when the river is very low, the Himawis above try to dam up the stream, and thus cut off the supply of water from their enemies, the Ghaffiris, and this plan, when successful, which, however, is rarely the case, quickly brings about a suspension of hostilities and a truce.

There is a daily bazaar or market held close under the north side of the fort, and consisting of the usual food-supplies required, fruit, vegetables, meat, and salt fish, but no cloth or hardware shops. Semail, indeed, can boast of but little trade. Authority is too weak, and the general feeling of insecurity too prevalent, to allow of much traffic being carried on.

The settlement is rich in "Fard" dates, one of the finest varieties of this fruit produced anywhere. It is the kind most appreciated and esteemed by the Americans, who are good judges, and a very large quantity of boxed Fard dates is annually shipped to the New York and Boston markets. At the period of which I am writing (1876), Muskat was regularly visited by sailing ships from Boston for cargoes of pressed dates in bags, but of late years a change has taken place, and the Fard dates are now packed in boxes, and exported to the United States by steamer. Fruits grow here in great abundance and variety, and of excellent quality. Muskat and other markets are largely supplied from Semail.

The only manufacture in the place worth mention is cloth-weaving,

and the creaking of the loom may be heard in every hamlet. Lungies, puggries, and khodrungs are the chief articles produced, the cotton of which they are made, both white and brown varieties, being extensively grown in the valley. The loom is somewhat heavy and clumsy in construction, and is horizontal (not vertical like the Jewish looms we read of in Scripture), and the weaver sits and works at it in a shallow pit with half his body below the surface.

The annual revenue derived by the Sultan of Muskat from Semail for local expenditure is said to be 6000 dollars; two-thirds of this amount being yielded by the zakât, or tax, and the remaining one-third representing the produce of the Bait al Mâl, or crown lands, which are usually farmed out.

The population of Semail is probably from 20,000 to 25,000 souls, but in such a large and scattered place is difficult to estimate.

The eastern range has fewer peaks, and presents a more broken contour, than the western. It is known by many different appellations as we pass along it, its highest peak (5250 feet) being called Jebel Tyin. Just above the village of El Zok the road to Ak branches off, and it takes three hours of very rough travelling to reach the village of that name. The Wady Ak is regarded as the key of Muskat from the direction of the Sharkiyah, or eastern province, as it offers the most direct route to the capital. When on the war-path to attack Muskat, the Sharkiyah tribes, if permitted, pour down this steep and rugged defile into the wild entanglement of hills and ravines beneath, and thence into the Wady Semail; but the Nedâbiyin tribe, to whom the Akabet el Ak belongs, is usually subsidized by the Sultan to hold the pass. The valley is here very much shut in, but I obtained a fine view of the gigantic mass of Jebel Akhdar from the village of Ghobra.

On an isolated rocky eminence rising sheer above the floor of the valley, to which it presents on the western side a precipitous cliff, 300 feet in height, stands the ancient castle, whose imposing aspect adds much to the local scenery. The position is a commanding one, and well suited to enable the castle to serve the threefold purpose for which it was no doubt intended, viz. to overawe the turbulent part of the community, to command the passage of the valley, and to protect the whole settlement.

The hill has been scarped at the base on all sides, and the plan of the castle has been entirely influenced by the nature of the ground. The massive barbican, or gateway, in which are apartments forming the residence of the akeed, or captain of the garrison, is on the eastern and lowest side, and is joined to the keep at the south-western corner by low curtain walls, embracing an area of irregular shape and considerable extent. The keep is a large circular tower of solid stone masonry, built on the highest point of the rock, affording a superb view over the valley. In the barbican are two wells cut through the

rock, giving an unfailing supply of water, and in the keep is a capacious reservoir, always kept filled. I counted eight iron guns in the fort altogether, three mounted on field carriages, the others dismounted. The castle was in a battered and shattered condition at this time, having sustained a bombardment during the recent operations undertaken by the Sultan to recover possession of it from a rebellious relative, but the wali informed me he had received orders from Muskat to repair the breaches in the walls. The wali is the castellan as well as the governor of the district, but does not reside in the castle, the guardianship of which is entrusted to the akeed, who at this time was a Belooch with sixty men under him. Sezzid Nasir told me he took care to interfere as little as possible with the tribesmen, and confined himself to maintaining peace and order and settling disputes. I gathered that the position he held was one demanding much tact, patience, and discretion, and was not a very enviable one, but he was evidently treated with great deference and respect by all.

Our host's hospitalities occupied all the forenoon, and I found my party extremely reluctant to make a move; but, though the day's march before us was no shorter than that of the previous day, I resolved to push on, and having taken leave of my courteous friend Sezzid Nasir, I mounted my camel and started.

From Semail castle the road winds down the valley in a north-north-easterly direction for 12 miles, as far as Serur, from whence it runs nearly due north. Serur is a rich and pleasant oasis of some extent in the possession of the Beni Hina tribe. At this point the stream disappears from sight, and sinks in the porous soil to flow underground for some distance, when it again reappears. A mile beyond Serur is the hamlet of Malita, and at another mile we came to Bidbid, a charming little oasis with a multitude of dates, rising like a green islet out of the broad barren sandy bed. In the centre is an old fortlet, untenanted, and fast crumbling to dust. Below Serur the hills begin to retreat from the river-bed, especially on the western or left bank, and the valley now gradually merges into a broad and open plain.

At Mizra, a village with an isolated rock and watch tower, the road to Muskat branches off to the right; but I may as well continue, from notes made on a subsequent trip, the description of the valley down to Sib, before going on with the narrative of the present journey. After leaving Bidbid, the path runs along the left bank over stony ground for about 5 miles, and then leads into a populous and thriving oasis called Fanja, the wady at this part being known as Batha Fanja. This town belongs to the Beni Hina and Hedâdebeh tribes, and is surrounded by a luxuriant belt of palms and well-cultivated fields, extending perhaps 3 miles in length. It lies 20 miles from Semail, and the population exceeds three thousand. The town owes its prosperity to the existence of excellent potter's clay in the neighbourhood, suitable for

cooking utensils and glazed earthenware. The large jars used by the indigo-dyers and similar vessels are also produced at these potteries. Just beyond Fanja a masonry aqueduct, 3 miles in length, called the Felej el Dhowaikar, runs at some height along the elevated right bank, and leads to a village and fortlet of that name, now in ruins. It was constructed, I was told, in the middle of the eighteenth century, by the Imam Sezzid Ahmed bin Said, to whom Dhowaikar belonged, and appeared to be an unusually costly piece of engineering for Arabs to undertake, but when, long years ago, Dhowaikar was destroyed and deserted, the aqueduct fell into desuetude and decay, and has since been breached in many places by mountain torrents. At three hours from Fanja, and about 35 miles from Semail, we arrived at the castle of Khoth, which is picturesquely perched on a solitary hill, rising out of the river-bed, with a hamlet and patch of fruit orchards below. It belongs to the Hedâdebeh tribe, and is considered a position of some importance, as the castle overlooks, and to some extent commands the lines of communication between Muskat and the Batina. On the left or western bank, the Wady Sakhnan, known in its upper course as the Wady Beni Jabir, unites here with the Wady Semail. It can be reached in the vicinity of Semail by a low pass, and affords, thence, an alternative and short road to the Batina plain. The country between Khoth and the sea, a distance of about 12 miles, is bare, uninhabited and uninteresting.

Resuming our journey from Mizra,* we took an easterly direction, and skirted on our right the hill range, which here trends along the coast, the path leading over a tract of broken and stony ground, very irksome to the camels, and necessitating a slower pace. Passing a low ridge known as the Nejd el Shubba, we rode for about 16 miles over a narrow maritime plain, much furrowed and intersected by ravines, and having several hamlets belonging to petty tribes, to Wataya, the site of a palace built by Sezzid Thowaini, now in ruins. It was now getting late, but in another hour or so, passing Rui and Bait el Felej, we arrived at Mutrah.

THE CRUX OF THE UPPER YANGTSE.

By ARCHIBALD LITTLE.

A DESIRE to see the upper Yangtse in flood-time induced us to venture upon a voyage from Ichang to Kweifu and on to Wan Hien, traversing the four great gorges and the principal rapids at a season when few care to brave the perils of navigation. The up-river trade from Ichang to Chung-king practically comes to a stop by the middle of June, and

* This is not the Mizra at Semail.

S.S. *PIONEER* GOING UP THE YEHTAN, THE WORST RAPID, ON HER FIRST VOYAGE.

is not resumed before the middle of September or later, according to the condition of the river and the amount of rainfall in West China. Those who, in the usual course of travel, have ascended the upper Yangtse only in the winter season, when the junk-traffic is at its highest, would not recognize the river in summer, when the freshets have come down and entirely changed its aspect, from that of a clear mountain stream, interrupted by a series of falls or steps with long smooth reaches between, to that of a huge brown torrent entirely filling its bed and bounded throughout either by vertical cliffs or by steep mountain slopes—rocks all "submerged full fathoms five," and deep water everywhere. The innumerable winter rapids are either obliterated entirely or metamorphosed into swift races; a rare junk is seen here and there sailing up in the eddies and long backwaters, or creeping slowly, towed by a double gang of trackers, round some awkward point; but generally the river appears deserted, the exuberant life and animation that surrounds the rapids in winter has entirely vanished, and the sleepiness of summer heat appears to have invaded the sparse towns and villages, while in between, for days at a time, one might imagine one's self to be exploring a new and uninhabited country. The cause of this cessation of traffic in the summer season is not so much the danger (that from the huge whirlpools is really serious), and which, to do Chinese boatmen justice, would hardly prove a deterrent, but the expense of the voyage is doubled; heavier crews are needed, and these have to be paid and fed for two, and sometimes three,

months instead of one; correspondingly high freights have to be paid and this again deters shippers; the north-east monsoon, which may be relied upon to provide a fair wind up the gorges from November to April, has come to an end, and without a fair wind parts of the gorges are actually impassable by large junks relying on man-power alone, as they may in summer have to wait days for a fair wind. To sum up, in short, when the upper Yangtse is navigable by steamers it is unnavigable by native craft, and *vice versâ*; to the observance of this condition are due the successful voyages of the steamship *Pioneer* (now metamorphosed into His Majesty's gun-vessel *Kinsha*) in the summer of 1900; and, conversely, to its neglect may be attributed the loss of the German steamer *Suihsiang* in the month of December in the same year.

Our voyage up the rapids, starting on June 14, 1901, occupied roughly as many days as, at the same date last year, the *Pioneer* occupied hours; thus to reach the big rapid, the "Yeh-tan," about 60 miles above Ichang, took us six days, as against the *Pioneer's* eight hours on June 12, 1900. We, on our third day out, passed the Tungling rapid, 35 miles distant from Ichang, on the rocks in which the *Sui-hsiang* was wrecked on the very morning of her departure from Ichang. This "pierced mountain" rapid is caused by the outflow from the Grand Mitan gorge passing through a nest of rocks, amidst which in winter the river forces its way in numerous winding channels. In June these rocks are deeply submerged, and only traceable by the boiling water as the 7-knot current sweeps over them. The long time spent by us in reaching this point was due to the difficulties of the

THE TUNG-LING RAPID AT ENTRANCE TO MITAN GORGE AT HIGH WATER.

"Yao-tsa-ho" below, as the winding reach, some 15 miles in length, which connects the Ichang and Mitan gorges, is called by the boatmen. The river valley here widens out, and, whereas in the two gorges the stream has cut its way down through the limestone mountain, making itself a passage with vertical walls 1000 to 2000 feet in height, in this connecting reach the river has to contend with a granitic formation, which it has disintegrated and broken up into piles of gigantic boulders, which lie strewn along the floor of the here widened valley in vast mounds such as none but Yangtse trackers, trained to them from childhood, would attempt to climb over. The "points" thus

THE TUNG-LING RAPID AT LOW WATER.

formed convert the Yao-tsa-ho into a continuous rapid, which the junk has to surmount without ever being able to gain a straight lead for its tow-lines; hence a perpetual struggle, which the imperturbable Chinaman calmly accepts as all in the day's work, but which is most exasperating to the impatient foreigner. To the geologist this reach is peculiarly interesting as the one point in the navigable Yangtse at which igneous rocks lie athwart the river's course, and where a dyke of porphyry has been cut through by the stream. Immediately above the Mitan gorge the valley, though still bounded by precipitous mountains rising to 3000 and 4000 feet, opens out, leaving a bench on either hand upon which are built the busy village of Hsin-tan ("New rapid") and

the picturesque houses of prosperous farmers and junkowners, forming a *coup d'œil*, that can hardly be excelled in any part of the world. Writing of the Hsin-tan as it appears in January, Mrs. Bishop remarks, "No description can convey an idea of the noise and turmoil of the Hsin-tan. I realized it best by my hearing being affected for some days afterwards. The tremendous crash and roar of the cataract, above which the yells and shouts of hundreds of straining trackers are heard, mingled with the ceaseless beating of drums and gongs, some as signals, others to frighten evil spirits, make up a pandemonium which can never be forgotten." If this indefatigable traveller could have seen the Hsin-tan when we passed up—all its rocks and boulders hidden, the shanties with which these are covered in winter all disappeared, the trackers having gone into the country for fieldwork; nothing but a smooth river, half a mile or more wide, with scarce a junk visible; the fine farmhouses and residences that dot the steep slopes on the south bank slumbering amidst their groves of bamboo and fruit trees; the long straggling terraced village on the north bank equally asleep in the June sunshine, with not even a dog awake to bark, she would have hardly credited the change, such is the contrast between the upper Yangtse in summer, when it has already risen 50 or 60 feet above its winter level, and may yet rise another 60 feet before autumn.*

Our light-draft junk warped up the short, smooth, steep slope of the Yeh-tan, a fall of about 8 feet, without difficulty. The two tow-lines are carried by a straight lead to and warped round bollards fixed in a wide solid stone bunding built for the purpose well above high-water mark, the whole operation, including the laying out the lines, involving us in scarcely two hours' delay. I may mention that our junk is one of the large "four-roomed" kwatsze, as the upper Yangtse houseboats are called, 80 feet long by 12 feet beam, 4 feet deep, and drawing light about 2 feet, easy to tow, and a fast sailer with her lofty mast and large light cotton lugsail. We have forty-seven men engaged in all—permanent crew of ten always on board, twenty-four trackers on shore, eight men in the tender constantly shifting the trackers from our junk to the shore, and from one bank to the other, or ferrying them across side streams and past otherwise impassable obstructions, and finally a crew of five men in the lifeboat, which follows close as a precaution in case of disaster. Above the Yeh-tan our progress was slow; the river was very bad, and the whirlpools at times baffling, notably that at the Niu-ko or Ox-head rapid, at the point where H.M.S. *Woodlark* was whirled against the rock bank and had her fore compartment entirely

* Fifty feet rise at the Shin-tan means a rise of 25 feet above low-water level at Ichang, where alone accurate measurements are taken by the officers of the I.M. customs, the water being dammed up above the narrows of the Mitan gorge.

THE WITCH'S GORGE, OR WUSHAN HSIA.

smashed in; this last was later rebuilt on the spot by her able commander and gallant crew—her engineer especially—and thus against all expectation she was enabled to pursue her voyage to Chungking. The record of this noteworthy event, which her crew painted in huge letters on the rock at the time, was submerged as we passed up. Then through the 22-miles-long "Great Gorge of Wushan," which it took us three whole days of hard struggle to surmount, into the *comparatively* open water that unites this chasm with the still worse chasm of the last of the four great gorges, the "Bellows" gorge, situated three miles below the celebrated city of Kueifu, and on the left-hand portal of which stands what is left of the "White Emperor's City."

Before reaching the lower entrance of the Bellows gorge, and opposite the Hoang-tsang-pei, a swirling rapid caused by one of the innumerable huge "cones of dejection," which small innocent-looking side streams appear to have vomited into the main river as the result of a one-time cloud-burst in the mountains behind, a very remarkable cleft in the 3000 feet which here forms the river's right bank, compels the admiration of the traveller. This cleft, the opposing cliffs of which may be half a mile apart, is well named by the natives the "Tso-kia Hsia," or "False Gorge," the legend being that when the Emperor Yü cut out the gorges through the mountains, that isolate Szechuan from the rest of China, and so drained off the great red basin, he at first set to work on

the Tso-kai Hsia, when, finding no way round, he diverted his attack to the higher mountains through which the Bellows gorge now makes its way, and cut out the present passage in its place. Through this narrow passage was now running a fierce torrent, the overflow of the lake-like expanse above. So far we had only experienced a recurrence of the minor accidents incidental to junk travel, tow-lines breaking, sheering out (ta chang) in the rapids (equivalent to missing stays at sea), and the like, but here our voyage came near to an abrupt conclusion. A strong fair wind that set in towards evening induced our pilot to attempt to sail through this 6-mile long gorge; under press of sail we were stemming the current famously, but the still fast-rising river had bred such terrific whirlpools that our large well-found junk proved like a cork at their mercy. We swung round and all but capsized; luckily the men, with much difficulty, succeeded in lowering the sail and bringing the boat up under a protecting point without damage. No such good fortune, however, attended two large cargo junks ahead of us, which we overtook at the entrance of the gorge; one of these, a vessel chartered by the Sechuan viceroy carrying munitions of war from Shanghai to Chêngtu (of which a continuous stream, including machine guns, has been flowing west for two years past) was whirled against the rock bank on the right and stove in and sunk, her crew escaping and the roof of the junk being just awash, so that the contents may possibly be salved when the water falls. The second junk, a fifty-ton cargo-boat

SHIUTAN.

laden with cotton yarn, sailed up the swift rapid in splendid form and disappeared in the twilight. I asked our pilot, who had now secured our boat for the night, why he too did not take advantage of the fair wind, which was still increasing in strength, to get through this difficult gorge. He replied that he could not feel sure of getting through before dark. At this moment a shout from our men, and just as the sudden darkness of the latitude had shut in, the big junk drifted by on her beam ends, having capsized in mid-stream. She was barely visible, but the cries of "Chiu Ming!" ("Save life!") were heartrending, just audible above the roar of the rapid. It was now pitch dark, but I

TURN IN MITAN GORGE.

suggested to our accompanying lifeboat to go after them; the helmsman, however—and rightly, I think—said he dared not confront the whirlpools in the dark. Two days later we learnt in Kweifu that about half the crew had been thrown overboard and lost, and that the boat herself, if still floating and not wrecked on the way, could hardly be brought up nearer than in the tranquil water off Ichang.

The Bellows gorge averages 300 yards in width, but is narrowed by projecting rock-spits in three places to half this width, and below these rage, at this season, foaming whirlpools. The spit under which we were moored for the night was composed of a very hard limestone and chert, and had the appearance of furnace slag. Rising some 30

to 50 feet above the present water-level, it is covered in the late summer freshets, and so the whole surface is water-worn; but the rock is too hard to be cut away in potholes, as we see has been, and still is being, done in countless similar reefs up and down the river. At the narrowest channel in this gorge, close to its upper end, the stanchions and rock-holes are still visible at low water from which chains were stretched across the Yangtse during the romantic period of the wars of the "Three Kingdoms," which ushered in the fall of the great Han dynasty in the third century of our era. All this region is rich in "song and story." Below this spot we see to-day, as fresh as it issued from the hands of the masons of old, the extraordinary relic known as Mêng-liang's ladder—a series of squared holes chiselled into the hard limestone cliff, here about 500 feet vertical, each hole 14 inches in diameter and about 2 feet in depth, into which were inserted wooden beams up which Mêng-liang's soldiers either ascended for attack or descended to procure water—it is not positively known which. The last emperor of the Hans, Liu-peh, was the builder of the "Peh-ti-ch'eng," or "White Emperor's City," so called after its supposed Celestial founder and patron, a beautiful temple in whose honour survives to this day. Its wooded terraces command a striking view of the gorge down stream, with its highest cliff towering up some 3000 feet, and of the picturesque city of Kweifu built on the left bank of the lakelike reach 3 miles above.

We passed a restless night, rocked in the swell of the rapid and disturbed by the roar of the whirlpools, which increased in violence as the river continued to swell in volume with the still-rising freshets, the total rise in the night being about 10 feet, necessitating constant shifting of the boat's moorings. At daylight the next morning we crossed over in the lifeboat to the left bank, and climbed up the steep rock-bank to the New road. This is a road built by a former viceroy in the fifteenth year of Kwangshü (A.D. 1888), from Kweifu westwards to the Hupeh frontier, a distance of about 50 miles, where, traversing the gorges, the road is carried by a gallery cut in the limestone cliffs and fenced by a low stone balustrade. Had the road been carried on farther 80 miles to Ichang, it would have been of inestimable value to travellers to and from Szechuan, who have practically no choice of any other than the Yangtse route. As it is, the road is useless; it ends in an absolute *cul-de-sac* in the middle of the Wushan gorge, and is already falling into disrepair. Squatters have not been slow to take advantage of the terraced portion to grow crops on, and have pulled down the stone balustrade in places and used it as foundations for their adobe cottages. So it is everywhere in China: a spasmodic attempt at some reform or improvement is made by some rare, public-spirited official or man of wealth; he is not seconded, and his work is rendered useless by the apathy and ill-will of the people generally. It seems to

me hopeless to look for any practical reforms in China unless under European supervision, capable of enforcing discipline and order as in the foreign settlements; left alone, the Chinese are incapable of what we call progress. If this road were to be completed and sufficiently enlarged, Kweifu would be brought within three-quarters of a day of Ichang, and thousands of lives, now annually lost in the rapids of the four great gorges, would be saved. But there is no present likelihood that this road ever will be completed. In a few more decades, what has been already begun will have fallen or been pulled to pieces and utterly forgotten.

The White Emperor's City, the western terminus of the New road, is now nothing but a small village. A portion of the old concrete wall is still in existence, pierced by an ancient gateway, through which the path leads on to the high-walled city of Kweifu, 3 miles above. It was here that Liu-peh made his last stand, and was killed A.D. 221, and so the famous Han dynasty succumbed to the short-lived Wei. It is hard, looking down at this season on the smooth lake 200 feet below, to conceive the existence of a manufacturing city in its centre, which is annually submerged each summer and again annually reconstructed each winter as the water subsides. Yet on this sandbank, now submerged several fathoms, I have seen the smoke of countless brine distilleries, and have walked among the brine wells, around which thousands of workmen were busily employed on the different processes, hastening to make the most of the short winter of work. In Kweifu coal is cheap (about 4*s*. a ton), as also plentiful.

Arrived at Kweifu, the perils of the voyage are practically over—at least, at this season. Hence to Wan Hien we had not the trace of a rapid; the bottle neck of the Bellows gorge had dammed up the water, and the fierce Miao-chi and the dreaded Hsin-lung-tan were absolutely non-existent. The river, now fully 100 feet above its winter level, and half to three-quarters of a mile wide, flowed smoothly between green slopes, not a vestige of rock being visible. The contrast between the deep bright green of the maize, which now covers the lower slopes, and the chocolate-coloured water, in which their feet were immersed, was very striking, as was the total absence of life and movement at the site of the New Grand Rapid, formed by the landslip of 1896. No trace of the town existed, the houses mostly removed, the site being under water; but on high ground above is a handsome and extensive building—a new Buddhist temple dedicated to Wang Se, the patron saint of boatmen, and subscribed for by the junkmen, to whom this rapid is a lasting terror in the winter season, for want of a few tons of dynamite judiciously expended.

One thing our summer voyage on the upper Yangtse definitely impressed upon us, and that is that a permanent and profitable steam-service is simply a question of supplying the needful capital for

suitable boats. Is this navigation to be carried on or to be abandoned to others by the British, who have been the first to successfully attempt it? In any case, we reached Wan Hien, fourteen days out from Ichang, with the firm conviction that this would prove our last ascent of the upper Yangtse in a Chinese junk.

GEOGRAPHY AT THE BRITISH ASSOCIATION, GLASGOW, 1901.

THE excellent arrangements at Glasgow for the 1901 meeting of the British Association contributed in no small degree to make the meeting the decided success which it is generally acknowledged to have been. Rarely has the Association been so fortunate in the quarters assigned to it as during the present year, when the use, generously permitted by the governing body, of the spacious buildings of the University of Glasgow, enabled the whole business of the meeting to be carried on within a compact area, and obviated the wide dispersal of the sections which has so often been found unavoidable in previous years. Although, taken as a whole, the attendances at the geographical section cannot be said to have been large, there is reason to look with satisfaction at the general results of the meeting from a geographical point of view. Dr. Mill's able presidential address, which was printed in the last number of the *Journal*, laid down, more clearly perhaps than had yet been done in this country, the true position and aims of geographical science, and should do something to bring about an improved understanding of that position on the part of educational authorities and the public generally, though it is probably too much to hope that it will once for all set at rest the objections of those who refuse to concede to the subject the rank of a science at all. The papers read maintained, on the whole, a fairly high scientific standard, and though this may possibly have acted as a deterrent to certain among the frequenters of the section, it can only be regarded with satisfaction by those who desire an improvement in the position held by geography in this country.

The officers of the section were as follows:—

President: Dr. H. R. Mill, F.R.S.E. *Vice-Presidents:* Sir T. H. Holdich, K.C.I.E.; J. Scott Keltie, LL.D.; H. J. Mackinder, M.A.; E. G. Ravenstein; Sir George S. Robertson, K.C.S.I.; Rev. Prof. George Adam Smith, D.D. *Secretaries:* H. N. Dickson, B.SC., F.R.S.E. (*Recorder*); Edward Heawood, M.A.; G. Sandeman; A. Crosby Turner. *Committee:* Col. F. Bailey, late R.E.; W. S. Bruce; A. Buchan, F.R.S.; Dr. J. Burgess, C.I.E.; G. G. Chisholm; Vaughan Cornish, D.SC.; Captain H. P. Deasy; Dr. Henry Dyer; H. O. Forbes, LL.D.; Prof. P. Geddes; A. J. Herbertson, PH.D.; Col. D. A. Johnston, R.E.; Captain Lemaire; Prof. J. Milne,

F.R.S.; Dr. F. Moreno; H. Yule Oldham; Staff-Commander Dubois-Phillips; Prof. A. F. Renard; T. G. Rooper; A. L. Rotch; Prof. G. F. Scott-Elliot; Eli Sowerbutts.

As usual, the section met on four days, and, in addition to the President's address, twenty-seven papers and reports were read, several being followed by important discussions. The following is a summary of the proceedings on the several days:—

Thursday, September 12.—Mr. Ravenstein gave an account of the old geographer, Martin Behaim of Nürnburg, best known as the constructor of the celebrated globe of 1492. It was shown to be exceedingly doubtful whether, as is stated by Barros, Behaim was a pupil of Regiomontanus, though it is possible that he did accompany the astronomer José Visinho on his voyage in 1484 to the Guinea coast, for the purpose of determining latitudes by the aid of the astrolabe. Behaim claimed to have accompanied Cão on his second expedition (1485–86), but Mr. Ravenstein showed that this claim cannot be allowed, though quite possibly Behaim took part in the expedition, also of 1485–86, of João Affonso d'Aveiro, which reached the Benin coast. Photographs and drawings of the famous globe were exhibited at the meeting, and it was announced that a full description and facsimile would shortly be published.

Mr. Ravenstein next presented the annual report of the Committee on the Climate of Tropical Africa, which, he said, had now completed ten years' work, and would not seek re-appointment, arrangements being under consideration for the publication of the results of observations in future under Government auspices. The final report gives returns from twenty-one stations in Africa, distributed between Egypt and the Sudan (2), Nigeria (1), Nyasaland (4), and British East Africa (14, including the four lake-stations in Uganda). It also includes the results of seven years' observation on the rainfall at Mengo (Uganda), taken from the unpublished journal of the late Mr. A. M. Mackay, as well as a table giving the rainfall since 1890 at a number of stations.

The ten years' work of the Committee has resulted in the publication of meteorological observations from seventy-one African stations; but of these only fifty-six show records for a complete year, and eleven only give a full five-years series. These latter are Lauderdale, Dunraven (rainfall only), Kisimayu, Malindi, Lamu, Takaungu (rainfall only), Mombasa, Chuyu (or Shimoni), Machako's, Fort Smith (Kikuyu), and Mengo (Namirembo and Natete). Especially careful and full observations have, however, been taken for shorter periods at Bolobo on the Congo, Kibwezi in British East Africa, Old Calabar, and at Zomba and Fort Johnston in Nyasaland, where most valuable work is being done under the direction of Mr. McClounie, the head of the Scientific Department. In the Egyptian Sudan stations are being gradually pushed forward by Major Lyons. The report also gives the

result of observations on the lake-level of the Victoria Nyanza, which were the subject of an article in the *Journal* for October.

Mr. Ravenstein briefly summarized the general lessons to be learnt from the results gained so far in relation to the possibility of European settlement in tropical Africa. No single district, he said, could really be regarded as possessed of a thoroughly healthy climate, for even where, owing to the elevation, the mean temperature is moderate, the fact that the days are hot and the nights cold renders the climate trying, while the humidity of the atmosphere at many of the stations is also a drawback.

Dr. A. J. Herbertson exhibited a morphological map of Europe, and described the various natural regions into which the continent may be divided, pointing out the connection which exists between the geographical structure and surface features. The paper was an excellent specimen of modern methods applied to geographical research.

In the afternoon Mr. G. G. Chisholm gave in outline his thoughtful paper on "Geographical Conditions affecting British Trade," which was printed in full in the last number of the *Journal*. An interesting discussion followed, in which, among others, Mr. Atkinson, well known as an American writer on economic questions, took part, pointing out certain conditions which were likely in the future to tell especially in favour of American trade, particularly if, as the speaker anticipated, a policy of free trade were inaugurated in the United States. Prof. Alleyne Ireland then spoke on the influence of geographical environment on political evolution. The subject, he said, was of great practical importance by reason of the attention now directed to the tropics and sub-tropics as a field for commercial activity, and the necessity, in the interests of trade, of the introduction of stable government in those regions. With very few exceptions, the natives of the tropics have hitherto shown themselves incapable of developing a government possessing any real element of stability, and this the speaker attributed to the lack of the climatic discipline to which the inhabitants of more temperate zones have been subject. He therefore held that the climatic conditions of the tropics have set an insuperable barrier to the advancement of tropical peoples in the direction of popular government, and that in this zone administrative affairs must rest in the hands of specially trained Europeans. Time did not admit of a discussion on the paper, which, from its controversial nature, might otherwise have elicited divergent opinions, and the proceedings closed with an account of itineraries in Portuguese Congo, by the Rev. T. Lewis, who, from much experience as a missionary, pointed out some of the problems awaiting settlement in Africa, notably that of the native races, destined as they are to increase rapidly when slavery and native wars and superstitions are done away with.

Friday, September 13.—The morning was devoted to papers on

Scottish geography, the first being one by Mr. Scott-Elliot on the effects of vegetation on the valley and plains of the Clyde. Investigations of the kind, though second to none in importance and interest, have hitherto received too little attention in this country, and the inclusion in the programme of papers of this character was a step in the right direction, as showing the wide field for scientific inquiry open to the physical geographer in our own country. Mr. Scott-Elliot began by defining the general characters of the Clyde valley, and next traced the successive stages in the formation of the valley slopes, the important part played by vegetation in the process being pointed out. The varying constitution of the flat land was then explained, and the work done by various marsh plants in their formation described.

The next paper, by Miss M. Newbiggin, described a scheme that has been set on foot by the Scottish Natural History Society, at the suggestion of Sir John Murray, for the detailed investigation of the Forth valley; the object being the collection of such facts in regard to existing organic conditions in that valley as may supply a basis for accurate generalizations in the future. Prof. W. G. Smith then gave an account of the Botanical Survey of Scotland, begun by his brother, the late Mr. Robert Smith, whose early death has cut short a most promising career. We are glad to learn that the work so efficiently begun is being continued by Prof. Smith, who described to the meeting the main facts of botanical distribution in the areas represented by various sheets of the Ordnance Survey.

In the afternoon Dr. F. Moreno exhibited a fine series of lantern slides, illustrating chiefly the ethnology of the recently explored districts in the west and south of the Argentine Republic. He was followed by Mr. Hesketh Prichard, who dealt with the same region, describing his explorations last year in the neighbourhood of Lakes Buenos Aires and Argentino, as well as his descent of the Rio Leona, and the discovery of a lake which seems not to have been visited by previous travellers.

The proceedings closed with a short paper by Mr. Reclus Guyon on the map of the world, drawn on a surface correctly representing the natural curvature of the globe, to the construction of which Mr. Reclus has devoted so much time and attention during the past few years.

Monday, September 16.—In the first paper of the day, read on behalf of the author by Staff-Commander Dubois-Phillips, Captain C. Lemaire gave a summary of the valuable scientific results of the Belgian Expedition to the southern Congo basin, with the main outlines of which our readers are already familiar. Especial attention was called to the barometric determination of altitudes, on which an unusual amount of care was bestowed, and which have given results of especial value for the construction of a hypsometrical map of Central Africa. The methods adopted for the astronomical determinations of position and for the

magnetic, meteorological, and other observations were also described, as well as the general nature of the fauna and flora of the regions visited. After the paper, a selection from the extensive series of excellent photographs, taken during the expedition, was exhibited by the lantern, while a striking collection of water-colour drawings of plants and animals was also on view.

Dr. Vaughan Cornish read the first report of the committee appointed at the Bradford meeting for the study of terrestrial surface waves. During his visit to Canada in the winter of 1900–1901, Dr. Cornish found good opportunities for the study of the snow-surface with which the country was covered during the whole of the expedition; the results will be published in the *Journal* at a later date.

Mr. H. N. Dickson then read a paper on the mean temperature of the atmosphere and the causes of glacial periods, which will be printed in a subsequent number of the *Journal.*

In presenting the report of the Committee on the Survey of British Protectorates, Sir Thomas Holdich (whose paper was read in his absence by the Recorder) laid down the main principles which should be kept in view in any scheme adopted for the furtherance of the object stated. A discussion followed, in which Colonel Johnston, Director of the Ordnance Survey, Captain Deasy, and Mr. H. J. Mackinder took part. Sir T. Holdich's paper will be published in an early number of the *Journal.*

Mr. Mackinder then read a paper by Dr. Robert Bell, Director of the Geological Survey of Canada, on the "Geography and Resources of Northern Ontario," which will also be printed in the *Journal.*

Mr. A. L. Rotch, of the Blue Hill Observatory in the United States, described a method proposed for the exploration of the atmosphere at sea by means of kites. He pointed out the paucity of the material at present available for a knowledge of the conditions which prevail in the upper atmosphere over large areas, especially in the tropics. The difficulty in the way of obtaining data in the region of calms by means of kites, could be overcome, he showed, by the use of steamers, specially chartered for the purpose, the motion of which would create the wind necessary for the raising of the kites. Much could also be done by observers on board the regular ocean liners in the Atlantic and elsewhere.

Lastly, an interim report of the committee on changes of the land-level of the Phlegræan fields was presented on behalf of Mr. R. T. Günther, who is still in Italy carrying out investigations on the subject.

Tuesday, September 17.—Mr. W. N. Shaw gave an account of the weather maps issued by the principal countries of the world, and pointed out the comparatively limited area for which such maps are yet available. The rest of the morning papers were devoted to the subject of antarctic exploration, Professor Rücker, the President of the Association, being present, and taking part in the discussion which

followed. Dr. J. S. Keltie sketched the organization and plans of the National Antarctic Expedition, while Dr. H. R. Mill described the voyage to Madeira, and the various arrangements on board for the carrying out of scientific observations. Mr. W. S. Bruce then described the present position and proposed work of the Scottish Antarctic Expedition, of which he is leader, and which, he stated, would start for certain next year.

Mr. H. Yule Oldham gave a graphic description of his recent experimental demonstration of the curvature of the Earth's surface. Like that of Dr. A. R. Wallace in 1870, the experiment was carried out on the New Bedford river, the 6-mile stretch between Welney and Denver being selected.

Dr. R. Logan Jack read a paper, which will eventually be published in the *Journal*, on a journey through little-known parts of Sechuan, across the upper Yangtse, Mekong, and Salwin rivers to Burma. It was profusely illustrated with lantern views. A paper by Mr. Archibald Little, in which the possibilities of navigation through the gorges of the Yangtse were discussed, was read by Mrs. Little, and the proceedings of the section terminated with a demonstration, by M. Galeron of Paris, of the use of an ingenious celestial globe of which he is the inventor, which permits the movements of the heavenly bodies to be followed, as in nature, from within the sphere.

On Monday, September 16, in addition to the ordinary meeting of the section, a special conference was held, jointly with sections C and D, to consider the important scheme put forward by Sir John Murray and Mr. Lawrence Pullar for the scientific study of lakes of the British Islands. Dr. H. R. Mill was in the chair. It is proposed to execute a thorough survey, extending over some years, which shall embrace not merely the geographical and morphological, but the biological and other scientific aspects of all the British lakes. It is hoped to secure the services of a competent staff of observers, and if successfully carried out the scheme should lead to the acquisition of most valuable results from the point of view of the various branches of science represented. The scheme is regarded as forming a fitting memorial to Mr. Frederick Pullar, whose lamented death has put a stop, for the time, to the work already begun. Letters were read from Sir John Murray and Prof. Bonney, after which Mr. Thompson (representing the Zoological section), Colonel Johnston, Director of the Ordnance Survey, Mr. B. N. Peach, Dr. H. R. Mill, and others, spoke of the importance of the proposed researches from many points of view. The proceedings terminated with the passing of a resolution expressing the gratification of the Conference at the decision to carry on the work, and its appreciation of the munificent support accorded to the project by Mr. Lawrence Pullar.

Papers with a more or less geographical bearing were read at several

of the other sections of the Association. That of geology has naturally most in common with geographical aims, and among the subjects dealt with were: "Perim Island, and its Relation to the Area of the Red Sea," by Miss C. A. Raisin; "The Artesian Water Supply in Queensland," by Dr. R. L. Jack; "Evidences of Ancient Glacier-dammed Lakes in the Cheviots," by Prof. P. F. Kendall and H. B. Muff. At the Zoological section various papers on coral islands were read, including one on the Maldives, by Mr. J. S. Gardiner, while the results of the latest researches on malaria were put before the section by Major Ross. The anthropological papers included accounts of various native races of South America and the Malay peninsula, in the latter case from the observations of the Skeat expedition, of which the leader himself was present; while the botanical section listened to several papers on distribution and regional botany.

Lastly, the Saturday evening lecture to artisans, by Mr. H. J. Mackinder, was distinctly geographical in character, and it is matter for satisfaction that the claims of geography were thus officially recognized by the Association in the choice of the lecturer. Mr. Mackinder took as his subject, "The Movements of Men by Land and Sea," showing the influence on human development exercised by the various means of locomotion, from the horse as used from the earliest ages by the nomads of the Asiatic steppes, to the various later uses of the wheel, culminating in the steam traffic by land and sea at the present day.

COLONEL ARNOLD'S MAP OF THE BARUE COUNTRY.*

THE Barue country to the south of the lower Zambezi has, until quite recently, remained one of the least-known districts of Portuguese East Africa, and the accompanying map, based on a survey by Colonel Alfred J. Arnold during a recent visit to the country on behalf of the Portuguese authorities, therefore supplies new information of considerable value. Colonel Arnold visited the country with the special object of studying the relations of the native chiefs, but he also paid much attention to the general geography and resources of the country, and supplies the following notes to supplement the information contained in the map.

The expedition started from Masikesse on September 19, 1900, and proceeded north, crossing the Gairedzi river into the Barua country (Makombo's territory) on October 12. Beyond the frontier, a distance of some 16 miles had to be traversed on the high plateau before the descent to the comparatively low level of the Pungwe basin was made. The highlands (of an average height of 5000 feet) supply excellent

* Map, p. 560.

pasturage, while the slopes of the valleys are well wooded, and the lower levels are covered with rich alluvial soil well suited for the cultivation of sub-tropical products. The elevated tract of land is exceedingly well watered, feeding innumerable rivulets which never dry up in the driest season. It sinks gradually to the north to the level of the watershed between the Zambezi and Pungwe basins, its eastern edge running nearly due north and south. At the kraal of Katandiga the country falls to an elevation of about 2500 feet, the open veldt giving place to an undulating plain sloping gently to the south-east, dotted here and there with kopjes and well watered by streams descending from the plateau on the west. Here the palm reappears, but the vegetation in general consists of thin bush and mimosa, easily cleared for cultivation. The expedition crossed the watershed towards the Zambezi at an elevation of about 3000 feet. The streams which flow north to the Zambezi, except those fed by the hidden waters of the plateau, are intermittent mountain torrents, but the beds of the Mopa and other rivers showed that during the rains large bodies of water pass down to the Zambezi, and it is probable that the contour of the country would permit the storage of water for the supply of the whole countryside. On the watershed the soil is dry and scanty, but at Mungari becomes rich enough for the production of coffee, vanilla, rubber, etc. This continues to the exit of the Muira from the hills, after which for some miles the country is composed of deep rich vegetable soil.

The geological formation of the plateau appears to be similar to that of the country near Masikesse. Granite is visible only occasionally, the hills between the Gairedzi and Katandiga's kraal being for the most part composed of talcose schist interspersed with quartz veins. Further north the kopjes and visible rocks consist almost without exception of banded quartzite with quartz reefs, and this extensive formation seems to be the matrix whence comes the alluvial gold found in the lower reaches of streams running into the Zambezi. An expert examination of this district is much to be desired.

The flora is essentially sub-tropical. Big timber is rarely met with, though possibly that around Inyakafura might prove suitable for export. Landolphias were met with on rare occasions only. The grasses of the plateau are good, and would supply excellent grazing. At present the native cultivation is not extensive, but this may be ascribed to the unsettled state of the country. The climate as a whole is healthy. On the plateau it is dry, cool, and invigorating, and consistently temperate throughout the year. Even on the lower plains colonization by Europeans is, in Colonel Arnold's opinion, certainly possible—much more so than in the valleys of Manica. Even in the rains two or more dry sunny days intervene as a rule between the downpours, while the prevailing winds from the Indian ocean are cooling

and pleasant. The resources of the country include minerals (gold, iron, copper, coal, etc.), agricultural products (which could be made to include tea, coffee, cotton, indigo, cacao, tobacco, vanilla, etc.), and those derived from cattle-rearing.

Colonel Arnold found the chieftaincy of the country in dispute between two rival claimants, each of whom called himself the Makombe. He considers, however, that Shupatora, the lawful successor, according to the customs of the country, though not the son, of the late king, is decidedly the more influential, his rival Nkanga (son of the late chief) having lost ground during the past five years. The disturbances which have prevailed within recent years in the Barue country seem to have caused an efflux of population, which is now estimated at 20,000 only.

THE MEAN TEMPERATURE OF THE ATMOSPHERE AND THE CAUSES OF GLACIAL PERIODS.*

By H. N. DICKSON, B.Sc.

It is not proposed, in this paper, to add another to the ever-lengthening list of theories which attempt to account for the occurrence of glacial periods. My object is rather to point out some consequences which must follow if we adopt certain of the theories still on trial, in the belief that some meteorological considerations, which I believe to have been insufficiently noticed, although hinted at by Howorth, Davis, and others, may help us in making a selection amongst the suggested theories, and thereby at least reducing their number. My attention has recently been drawn to this subject by Mr. F. W. Harmer, who has attempted to account for some features of the glaciation of the northern hemisphere by suggested changes in the normal distribution of barometric pressure.

It will be conceded that theories assuming an arrangement of climatic belts precisely similar to those existing at present, but symmetrically displaced through a given angle, must be abandoned. For example, the position which must have been occupied by a pole of cold, if we are by its means to explain the distribution of the permo-carboniferous glacial deposits in the southern hemisphere, so far as it has been ascertained, is unintelligible alike to the geologist and the physicist. It involves an antipodal area of cold and an antipodal ice-sheet, with intermediate areas of warmth, the existence of which is unrecognized; and it does not even account for many features observed in the deposits themselves. Again, it is almost impossible to conceive any physical cause which can have so displaced the climatic zones of the globe without producing effects which would leave behind them more formidable traces than those due to glaciation.

Leaving such hypotheses out of account, there remain two sources from which a possible explanation of glacial periods may be derived—

1. Tectonic changes, which may have either raised the region to be covered by an ice-sheet—or at least part of it—above the snow-line, or may have so altered

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* Paper read in Section E (Geography) at the Glasgow Meeting of the British Association, September, 1901.

the distribution of land and sea that the prevailing winds have changed their direction, and thereby caused lowering of temperature over certain areas sufficient to greatly lower the snow-line.

2. General lowering of the mean temperature of the atmosphere.

Firstly, tectonic changes.

It is difficult to suppose that the necessary lowering of temperature can have been produced by elevation alone. A great elevation and extension of the land area no doubt occurred during the Pliocene period, but its culmination was reached before the Pleistocene period, and J. Geikie states emphatically that glacial periods are characterized by submergence, and inter-glacial periods by emergence. Conceivably, the discrepancy in time may have been due to a species of lagging; the elevation of the land caused an ice-sheet to form gradually over it until the surface was depressed, isostatically, by the weight of accumulated ice and the cooling of the crust itself; then the increased temperature at the lower level caused melting of ice, relief from part of the weight, and consequent springing back to higher levels, when the weight of ice increased again; and so on, till the primary tectonic cause of elevation disappeared. But this seems more likely to assist in accounting for the smaller variations occurring during a great glacial period than for the main fact of the glacial period itself. The first elevation to the snow-line, even in fairly high latitudes, seems to involve vertical movements which in geographical relation and in scale are difficult to admit, and we must conclude that the effect of such movements as did occur cannot, in the first instance at least, have been direct.

The effect of elevation in extending the land areas must also be rejected as an efficient primary cause. It is true that if the land areas are extended continental conditions prevail over wider fields, and the winter temperatures are greatly reduced. But summer temperatures are correspondingly increased, and at the same time the precipitation in the form of snow is diminished by the anticyclonic conditions induced during winter. Hence we get nearly the same mean temperature, with less snowfall, and the occurrence of ice-sheets over such regions is contrary to experience: witness Siberia. Note here that these conditions are not to be confounded with the conditions of high pressure induced as the *effect* of an ice-sheet, as in Greenland, or, as seems probable, on the antarctic continent.

It has been argued that the extension of land surfaces might so alter the positions of the centres of high and low barometric pressure that glacial conditions might be induced by the change of direction of prevailing winds. We have already seen that the establishment of an ice-sheet within continental anticyclonic areas is unlikely. But if the land area is increased the sea area is diminished, and the ascending vortices or cyclones during the winter seasons must increase correspondingly in number and intensity in order to feed the increased volume of the descending currents over the land. The tendency would therefore be to increase the amount of condensation taking place within the cyclones, while their opportunity of penetrating into the land would be diminished rather than increased. Thus the proportion of cyclonic precipitation received on the land in the form of snow would be less, the total snowfall would probably not be increased, and, in any case, it would tend to be deposited on the eastern sides of the land areas rather than on the western. Finally, the ascending currents over the continental areas during summer would induce strong descending compensating currents over what was left of the oceans, which would then be occupied by enormously exaggerated systems analogous to our "Atlantic anticyclone," greatly raising the summer temperature of the maritime regions.

We are therefore led to inquire, secondly, whether the nature and distribution

of glacial phenomena, as they are at present known to us, can be more adequately accounted for by supposing a lowering of the mean temperature of the atmosphere as a whole to have taken place, and whether an adequate cause can be found which may have produced the necessary change of temperature.

The mean temperature of the air is determined by the ratio between the heat received by radiation from the sun, and that lost by radiation into space. Now, a change of mean temperature may be supposed to take place in two ways: every part of the atmosphere may undergo the same change, *i.e.* the atmosphere may be equally heated or cooled in all latitudes, the polar regions may be cooled or warmed more than the equatorial, or conversely. The effects of any change, direct or indirect, must evidently be very different according as it takes place in one or other of these ways. For if it occurs in the first, a genial climate in high latitudes must coincide with intense heat in the tropics, and a temperature climate in the tropics with intense cold in polar regions; but the temperature *gradient* from equator to pole must remain the same. The whole atmospheric circulation, and the consequent arrangement of the climatic belts, is, however, caused and determined by the difference of temperature between the equator and the poles, and there is no reason to suppose that a change in the absolute temperature would seriously modify either the form or intensity of the circulation, unless that change was very large. We should expect to find that evidences of climatic change in the past would adhere to parallels of latitude; traces of genial climate in high latitudes would go right round the parallels, and would correspond to an equatorial belt of intense heat, which, it may be supposed, would leave some record in the forms of animal or plant life; and traces of great cold in the higher latitudes (not necessarily in the form of ice-sheets) would correspond with belts of temperate climate in the tropics. It will be conceded that this does not satisfactorily agree with known facts.

Coming, then, to the case where the cooling is unequal, it seems scarcely worth while to seriously consider the case where the equatorial belt is cooled more than the polar. Such a change would explain no known fact, and imagination would be hard put to it to find even a possible explanation.

Suppose the lowering of the mean temperature to be due chiefly to cooling in the higher latitudes, the change at the equator being relatively slight. A comparatively small change in the total heat received and lost will then enable us to account for great cooling at the poles. A fall of 5° near the pole would mean a reduction of the mean temperature of, approximately, a little over 1°.

But a change of this kind involves other variations. The fall of temperature near the poles being greater than that near the equator, the equator-poleward temperature-gradient is increased. Now, according to the theory of Ferrel, if the whole atmosphere were at rest relatively to the Earth's surface, and if it were of uniform temperature, it would *remain* at rest. But if the equatorial regions have a higher temperature than the polar, a disturbing force arises which acts in the planes of the meridian, and causes an interchanging motion of the air-particles along those planes. On account of the Earth's rotation, a torsional force comes into play which causes a very great easterly velocity of the air in the higher latitudes, and a large, but considerably smaller westerly velocity in the lower latitudes, and the easterly velocity increases in proportion to the height above the surface of the Earth. The greater the temperature-gradient between the pole and the equator, the greater is the velocity of interchanging motion between the equatorial and polar regions, and the greater the torsional force which causes an easterly motion at the surface in the higher latitudes, and westerly motion in the lower; for the greater the velocity of interchanging motion, the faster a particle of

air settles down in the higher latitudes from a stratum where the velocity is greater to one where it is less, or the faster it rises up in the lower latitudes from a stratum where it is less to one where it is greater. Thus the acceleration of easterly velocity, positive or negative, is greater the greater the temperature-gradient, and consequently the greater is the force which overcomes the resistances, due to friction and inertia, to the east-and-west motions at the Earth's surface.

But, further, when the friction of the air moving over the Earth's surface is taken into account, we have the condition imposed that the moments of gyration of the air moving eastward must be equal to those of the air moving westward, otherwise there would be a tendency to change the velocity of the Earth's rotation. Any increase in the force causing the motions is likely to cause a displacement of the boundary between east-and-west motions at the surface, *i.e.* of the tropical belts of calms.

The net result is, then, that if we increase the difference of temperature between the equator and the poles, we increase the velocities of both the trade winds and the westerly winds of higher latitudes, and we displace the tropical high-pressure belts to positions nearer the equator.

Illustrations of changes of this kind may be derived from known conditions on the Earth's surface. During winter, the difference between the temperature at the equator and the north pole is nearly double what it is in summer, and the velocities are greater, although in a less ratio. Again, the mean velocities for the year, both of the trades and of the west winds, are greater in the southern hemisphere than in the northern, and the axes of the high-pressure belts lie in 30° S. and 35° N. respectively, more than can be accounted for by the displacement of the meteorological equator (due to other causes) to about 2° N.

Applying these results (which, it must be understood, are entirely qualitative, since our ignorance of the coefficients of friction depending on the distribution of land and sea, the nature of the land surfaces, etc., prevents definite numerical calculation) to the particular case of the northern hemisphere, we find that a lowering of the polar temperature has the effect of increasing the strength of the west wind circulation, and at the same time extending its influence at the surface to lower latitudes than is the case at present. The easterly currents, having necessarily a poleward component, *against* the temperature gradient, constantly tend to develop vortices or eddies—the familiar cyclones or depressions of these islands; and the stronger the current the more violent and frequent these cyclones are likely to be; under present conditions we find this in winter, contrary to what ought to happen if these systems were, as was once supposed, of purely convectional origin. But with the increased strength of the easterly current the relative influence of the continental land masses is diminished, and since at the same time the tropical belt of calms is displaced equatorward, the normal cyclone track will be displaced to lower latitudes, and will run more west to east instead of south-west to north-east, as at present.

With a general lowering of temperature, we might therefore have, in western Europe, a main cyclone track whose central axis would probably run from near the mouth of the English Channel eastward and only slightly northwards, to a point somewhere in the region of the Kara sea. North and west of this line, on the polar side of the depressions, an increased snowfall would be deposited during winter, and the cloudy conditions prevailing during summer would depress the temperature sufficiently to reduce the melting almost to vanishing point, even near sea-level. It is to be observed that in this region the prevailing cyclonic winds would then be from the east, a fact which may serve to explain some peculiarities of the

glaciation of the Scandinavian peninsula, and which accounts incidentally for the shell deposits of the Upper Crag on the east coast of England, at that time a lee shore.

Again, the north-easterly drift of surface water in the Atlantic would be greatly modified. This drift is at present most marked during the winter season and its climatic effect is comparatively slight. During summer the Atlantic winds, although weaker in the higher latitudes, are more nearly west, and water is banked up against the European coast, escaping northwards and southwards in stream currents of very considerable volume. The northern branch of this stream current, which I have proposed to call the European stream, penetrates far northward, and melts large quantities of ice in the region north of Iceland and round Jan Mayen, the water flowing southward and westward as a surface current during autumn, covering over the warm waters of the European stream, and keeping up atmospheric pressure during early winter. The effect of this distribution, if strongly developed, as during the past winter, is to make the winter cyclones move more directly eastward into the heart of the continent. The modified movement of the cyclones suggested during the cold period would greatly increase this action, the whole of the Norwegian sea would be permanently flooded with cold water, and the surface movement along the European coast would be southward all the year round, a result predicted by J. Geikie.

As the cyclones penetrated eastwards, many of them no doubt following the line of the Mediterranean, the precipitation would diminish as the supply of vapour gave out, and sufficient snowfall to produce an ice-sheet would only be found at proportionally higher levels—following the results recently obtained in the Alps, the Carpathians, and the Balkans, by Penck, Cvijič, de Martonne, and others.

On the southern side of the cyclonic axis we should find a region of strong westerly wind and abundant rainfall, which would give a cool rainy climate to the whole of the Mediterranean region, extending into northern Africa, probably over a considerable part of the Sahara.

Thus for Eurasia generally, the difference from present conditions would be, more snow in north-western Europe, and rain in the south, the fall diminishing eastward until in the Asiatic regions the climate would be simply cooler, with smaller extremes of temperature, and more snow at greater elevations, as in the Himalaya.

Turning to North America, the cyclonic area would run more north-west to south-east, many of the depressions from the Pacific failing, as they do now, to cross the Rockies. In this case the western and south-western sides of the cyclones would afford more snow in proportion than in the cyclones of the Atlantic, and we should therefore expect to find the edge of the ice-sheet further south, at least near the eastern side. This is precisely the outline represented by Chamberlin and others, and it would be very difficult to account for it by an atmospheric circulation of any other type, unless, indeed, we suppose the glacial periods of Europe and North America not to have been simultaneous, a view which seems to raise more difficulties than it explains. Such cyclonic movements would also account for Gilbert's "moist periods," coinciding with the glacial period, in the region of Lake Bonneville and Lake Lahontan.

In the case of the southern hemisphere, the field of observation is of course much more limited, and it has not been so fully explored. A summary of what is known about permo-carboniferous glaciation in southern latitudes, published recently by Penck, is interesting in this connection. It appears that glacial action during that period has left traces in Victoria and New South Wales, Natal and the Transvaal, and possibly also in the Argentine, all in lat. 30° to 40° S., and

on the east sides of the land masses. The actual evidence of ice-action seems somewhat obscure, and the Gondwana Land question has relations to this part of the subject which I confess are far from clear to me. But if we suppose climatic changes to have taken place in the southern hemisphere in a manner analogous to those described in the northern, the Roaring Forties, which must then have attained a violence truly appalling, many have extended to within 20° of the equator, and the latitudes named would have come within the polar half of cyclones, which would deposit abundant snowfall on the eastern coasts.

Greater interest, perhaps, attaches to Penck's investigation, in the same paper, of the relative positions of the snow-line in South Australia and New Zealand during the quaternary glacial epoch and at the present time, which he shows to be almost precisely the same as those in the Pyrenees. This result, if extended by further research, goes a long way to show that the cold periods were of planetary and probably simultaneous origin, and that they were not primarily due to changes in the land or sea surfaces.

It is impossible here to go into the subject with more detail, but if the meteorological conclusions are correct, or even in the right direction, it seems that the assumption of a lowering of mean temperature, taking place chiefly by cooling in the polar regions, enables us to account for a glacial period by changes of temperature and of the distribution and amount of precipitation, considerably smaller than has been supposed. The increased strength of the planetary circulation is almost a necessary consequence of increased temperature gradient: the displacement of the tropical high-pressure belts is a matter of more uncertainty, for their position on the Earth's surface is dependent on friction to an extent which cannot at present be definitely ascertained by calculation. But if, from the analogy of the two hemispheres, we admit the occurrence of this displacement, it seems that the snowfall will be distributed in a way which will go far to account for the supposed positions of the ice-sheets.

The climatic changes accompanying a *rise* of temperature in the polar regions present some points of interest. The temperature-gradient becomes less steep, and the atmospheric circulation consequently less active, while the tropical high-pressure belt moves further from the equator. Hence the arid belts extend into somewhat higher latitudes; we may suppose the Mediterranean region to become one of intense drought like the Sahara. The geological evidence indicates that in Miocene times Spain had the present climate of Morocco. In the west wind region, the general movement is slower, and, the land and sea influences being relatively stronger, the contrast of oceanic and continental types of climate is increased. Thus on the whole the variation in latitude is diminished, and climate becomes more uniform over large areas. Over the Atlantic the stream currents would be weakened, and the surface movement would be of the drift type, northward along the European coast, with little melting of ice, and consequently warm surface water, a result again agreeing with Geikie's account of the inter-glacial periods. Over Europe the oceanic influence would be much more restricted to the western coast, and the continental climate would probably extend over the greater part of Germany and France, and perhaps also Sweden, a result again agreeing with Geikie, who remarks that during inter-glacial periods the climate of western Europe was that of a steppe. We might expect, from the direction of the main cyclone tracks, that during such a period the climate would in the higher latitudes be milder to north-east of the oceans, especially the Atlantic, than to north-west. I am not aware whether there is evidence of any such difference between, *e.g.*, eastern Greenland and Labrador, but it would suggest that the glaciation of north-eastern America would be more intense and protracted than elsewhere.

Until the question has been subjected to mathematical analysis, it is perhaps premature to attempt to apply the suggestions made to the surviving theories of the causes of glacial and genial periods. The chief point to which I would draw attention is the very small change of mean temperature necessary on the conditions assumed, and therefore the relatively small cause required to produce the desired effect. The occurrence of changes in the intensity of insolation, due to a change in the Earth's mean distance or the eccentricity of its orbit, or to a change in the value of the solar constant, seems very unlikely. It is difficult to say precisely what would be the effect of such a change on the temperature-gradient between the equator and the poles; but it seems probable that this would not alter much except for a large change of mean temperature, which, as we have seen, does not fit well with the facts.

Of the possible causes likely to give rise to large proportional changes in the gradient for a small change of mean temperature, two only need be mentioned: change of the obliquity of the ecliptic, and change of the transmission coefficients of the atmosphere for bright or dark rays. According to Stockwell's calculations, the mean value of the obliquity is nearly 23°·3, with a maximum of 24°·6, a minimum of 22°·0, and a period of about forty thousand years. At a period of maximum obliquity the pole gains about 5 per cent. on its present insolation, and the equator loses about one half per cent., corresponding to a warming of about 1°·6 C., and cooling of 0°·2 (or increase in the gradient 1°·8). An epoch of minimum obliquity corresponds to a cooling of 2°·7 C. at the pole, and warming of 0°·4 at the equator, or an increase of 3°·1 compared to present conditions. But it is impossible to say how far those changes represent the actual variation of gradient at the Earth's surface; the change would probably be greatly increased by the lowering of summer temperature due to increased cloudiness. In any case, however, it seems, from what has gone before, that the range of temperature-variation, although small, is at least of the order of magnitude required.

The effect of a slight change in the transmissive coefficient of the atmosphere, in altering the equator-poleward temperature-gradient, is very great. Assuming the present value to be about 0·6, the Earth receives (in arbitrary units) 170·2 at the equator, and 28·4, or less than one-sixth, at the pole. If the value is increased to 0·7, the equator receives 209·2 and the pole 45·0, or nearly one-quarter as much. L. de Marchi has worked out the temperature-change produced by a reduction of value from 0·6 to 0·54 for oceanic and continental climates, and finds an increase or gradient of 4°·7 C. for continental regions, and 1°·8 for oceanic. These again seem to be of the order of magnitude required.

The question remains as to how far such a change in the coefficient is likely to have taken place, and what cause or causes can be assigned for it. Any alteration in the transmissive power of the atmosphere for bright solar rays is very unlikely, but a change in the amount of water-vapour or carbonic acid would produce marked variation in the transmission of dark rays, these substances being nearly opaque to long-wave radiations. Thus, if the quantity of carbonic acid in the atmosphere increases, the temperature of the ground and of the lower atmospheric strata will be raised, till the increase of radiation into space has restored equilibrium between gain and loss of heat. Aqueous vapour, although it possesses similar properties, is unable itself to produce any radical change of temperature, for the quantity of aqueous vapour in the atmosphere depends on the temperature of the air; if the temperature be lowered by some other cause, as by radiation, the vapour is partly condensed and its protecting powers diminished—then the increased radiation again causes further condensation, and so on.

Arrhenius has calculated the probable departures from present atmospheric

temperatures which would be caused by multiple changes in the present amount of carbonic acid. If the amount of carbonic acid were reduced to two-thirds, this would represent a fall of temperature of about 3°·1 C. in all latitudes from the equator to at least 65°. If the amount were trebled, temperature would rise about 7°·3 at the equator, and 9°·3 in lat. 65°. Thus we have, with a rise of temperature, a marked diminution of the temperature-gradient, but with a fall of the order required the gradient remains much the same. But if we take into account the corresponding changes in aqueous vapour, and especially the changes which would be induced in the amount of cloud, there are many reasons to suppose that not only would the total effect of a given variation in the amount of carbonic acid be much greater than that represented, but the effect of a diminution would be to considerably increase the temperature gradient.

The amount of carbonic acid in the atmosphere at the present time is represented by about 45 parts in 100,000 (by weight), and Hogbom finds that agencies now at work on the Earth's surface are capable of producing or absorbing, in a single year, quantities which form a not unimportant fraction of this amount. But a serious increase in the total carbonic acid necessary to produce a given change in the atmosphere results from the fact that of all carbonic acid set free, the ocean absorbs nearly five-sixths. Chamberlin, and more recently Ekholm, have discussed the question from a geological point of view, and believe that liberation and absorption of carbonic acid may actually have taken place on the scale required; and Ekholm has even formulated a scheme showing alternate liberation and absorption, and consequent succession of warm and cold periods.

REVIEWS.

ASIA.

Khurasan and Sistan.*

In 'Northern Afghanistan' Colonel Yate gave an account of Afghan-Turkestan from Kabul to Herat. In this volume he carries the narrative further west into Persia, and describes the north-eastern provinces of that country from the Kurd and Turkoman country along the Russian frontier to the north down to the confines of Baluchistan on the Indian frontier to the south. He also gives an account of a stay among the Goklan and Yamut Turkomans, "hitherto comparatively unknown," as well as of a trip to the source of the river Gurgan, "never before visited by any European traveller." Colonel Yate also has a good deal to tell of the Afghan and Persian soldiery, of the official and commercial sides of Persian life, of the recent changes in Persian society, and of certain of the notable sights of the country of the Lion and Sun, especially the shrine of Imam Raza at Mashhad, the tomb of Omar Khaiyam, and the turquoise-mines at Madan. The Russo-Afghan frontier is also described in chapter ii., the Russo-Persian frontier in chapter iii., the Persian-Afghan border in chapter ix., Astarabad and the Caspian in chapter xvi. Three years' experience as British Consul-General at Mashhad gave the author his opportunity, and he has used it with great industry and patience, as well as with admirable temper and good sense. It might have made the volume more interesting to its general reader if a stricter selection had been observed in the narratives of social functions and of excursions to the more obscure Persian localities; but Colonel Yate professes to write with the special object of helping brother officers in the

* 'Khurasan and Sistan.' By Lieut.-Colonel Yate. Blackwood. 1901.

Indian army "who may think of visiting Khurasan and Sistan, or who may take an interest in Central Asia," and for this purpose his book is no doubt well adapted. Every educated man must read with interest the graphic account here given of Mashhad itself, of its antiquities, its shrines, and its festivals; every "decadent" will be shocked to hear of the Persian neglect of Omar Khaiyam's grave and memory; every lover of a good story will be delighted to hear the author's confirmation of the classic tale of Afghan cavalry fitting themselves out in cast-off coats of guards and ticket-collectors of the South-Eastern and Metropolitan Railways.

WESTERN CHINA.*

This record of travel on the Tibetan border professes not to make any addition to geographical exploration, but simply to give a picture of "China among the mountains, far removed from Western influence." "No newspapers, no public post, no roads beyond foot-trails, no street-cleaning, no drains, no fires in winter, and no ice in summer,"—these are the drawbacks of the Highland China, in which Mr. Little has been travelling; and over against them is a brilliancy of costume such as might have been found in mediæval or sixteenth-century Europe,—"all but the very poorest being richly and gracefully clad,"—an exquisite harmony of simple buildings with grand surroundings, a picturesque agreement of man with nature. Mr. Little's chapters originally appeared in the *North China Herald*, and are now republished with fifteen excellent photographic illustrations. The map is copied from Mrs. Bishop's. Starting from Chung-King, on the upper Yang-tse, Mr. Little's journeys show three main lines of travel westwards to the frontier of Tibet—one up the valley of the Fo-Kiang; one by the basins of the Chung-Kiang and Min-Kiang; and one by Kiating-fu, Mount Omi itself, and Yachau. The whole work, in other words, is devoted to Sechuan province, and forms a useful parallel to Mrs. Bishop's volume on the same region. The two authors are practically in agreement in their enthusiasm for it, as the loveliest, most prosperous, and pleasantest part of China. Unfortunately, of late years various causes have led to the exhibition of a very different feeling towards Europeans, Mr. Little notes, from what was the case ten years before. "Then one never heard an uncivil word, now one is constantly jeered by the rabble," he complains; "whatever be the cause, the temper of the people is entirely changed for the worse, and successful rioting has deeply lowered the prestige we formerly enjoyed." The firm hold which Buddhism has taken of this highland section of the Chinese race is equally emphasized both by Mrs. Bishop and Mr. Little, but the latter is more political in his outlook on Tibet. "Our countrymen in India need" it "as a real sanatorium;" and the recall of the Macaulay mission, when it had advanced within three days of Lhassa and routed the natives with some slaughter, is deeply regretted by the author, who thinks China, "at least in the Tibetan question," a pure *quantité négligeable*.

KAMCHATKA. BY H. V. SLIUNIN.

These two volumes in Russian ('Okhotsko-Kamtchatskii Krai, yestestvenno-istoritcheskoe Opisanie,' or 'The Okhotsk-Kamchatka Region, a natural-historical description,' by Dr. H. V. Sliunin; with a map, 32 photographs, and 54 zincographs, St. Petersburg, 1900) are probably the most complete and valuable work ever published on the far North-East of Asia. It is no secret that M. Witte, who, as Minister of Finance, may be said to direct the main activities of Russian material progress, takes great interest in the development of these regions; and

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* 'Mount Omi and Beyond.' By Archibald Little. Heinemann. 1901.

the recent announcement of the new railway to be built from Irkutsk to Yakutsk, which may possibly be continued in course of time to Behring straits, lends interest to the present study. In 1895–98 M. Sliunin, as representative of the Ministry of Finance, took part in the Kamchatka-Okhotsk expedition, sent out by the Russian Government, with the object of studying the whole of these immense regions in their economical and ethnographical aspects. The journey occupied three years, and the itinerary is marked in red upon the general map accompanying these volumes. Herein, then, for the first time we have an adequate and even exhaustive treatment of the countries once forming the sole Pacific seaboard of Russia, and Dr. Sliunin may be warmly congratulated on the result. Russian colonization has hitherto affected Kamchatka and Okhotsk but slightly; in the present volume, therefore, besides the natural features, fauna, and flora, it is the native types which are principally noticed as representing human settlement in these lands. The illustrations of people, dwellings, garments, hand-made articles, etc., are excellent; while the map bears evidence of the most careful preparation, and both from its size and style must rank, we suppose, above any other cartographical guide to the wild rocky lands around the Sea of Okhotsk. But for that intervening lake-like mass of inhospitable sea, Kamchatka would long ago have been touched by the new movements which are making a second Russia in Northern Asia; Dr. Sliunin's map shows us the chief barriers to its civilization at a glance; and the letterpress of his travels and observations demonstrates the care with which Russians are now studying the most arctic and inaccessible of their Asiatic possessions.

Dr. Futterer's Journey through Asia.*

This first volume (pp. xxv., 545) of 'Erfahrungen, Forschungen, und Sammlungen' is devoted to an account of the author's journey, in company with Dr. Holderer, from the Caspian to the Pacific, and forms, in his own words, a series of *Geographische Charakter-Bilder*. It is illustrated by 203 photographs in the text, 40 separate plates, several elevation plans showing portions of the route, and a general map, in which the whole of the itinerary, from Karlsruhe to Shanghai, is marked with a sufficiently clear red line on a rather sketchy and indistinct chart.

Dr. Futterer's route, after leaving Osh in Ferghanah and the comparatively settled districts of Russian Turkestan, lay over the Terek-Davan pass, through Kashgar, along the valley of the Tarim, by way of Aksu, Karashar, Turfan and Hami, across the Gobi desert from Hami to Su-cheu, along the Great Wall to Liang-Chu, thence to the Koko-Nor district, across the uppermost waters of the Ho-ang-ho, through North-Eastern Tibet, and so down to Singanfu, Han-kau, and the mouth of the Yang-tse. This most interesting and important journey is admirably illustrated by one of the best and most judiciously selected series of Asiatic views and types that could be readily found; and in general it forms no unworthy parallel to the work of Sven Hedin. Especially noteworthy are the chapters on the northern valley of the Tarim and the Eastern Thian-shan, on the Gobi in its central portion between the Barkul-Hami oasis and the end of the Great Wall, on the Koko-Nor district, and on the mountainous region between Koko-Nor and the King-ho (chaps. iv., v., vi., vii., viii.). Great attention has been paid to describing and illustrating the geology and zoology, as well as the geography and anthropology, of the countries traversed. The lucidity of the text, the scientific and appreciative spirit evident throughout, is no less admirable than the clearness and representative character of the illustrations. In every respect, except, indeed,

* 'Durch Asien.' By Dr. K. Futterer. Reimer. 1901.

the *Uebersichts-Karte*, this is a travel-record of the first class, and must reflect the highest honour on the expedition itself, on the government of the Grand Duchy of Baden, to whose support the enterprise was largely due, and to the German spirit of watchful enterprise in which the whole was planned and executed. It has been said that books of travel rarely attain to literary form; in the present volume, scarcely less than in those of Sven Hedin, an excellent natural style reinforces the inherent interest and value of the subject-matter.

DEASY'S 'TIBET AND CHINESE TURKESTAN.'*

Captain Deasy's book possesses a twofold value. The plain unvarnished tale of travel and adventure, told with soldierly reticence, must always have a fascination for that ever-increasing section of Britain's young manhood which daily deplores the ever-decreasing area of the world's *terra incognita*. But apart from this, and beyond it, there is the value of a thoroughly scientific investigation into the geographical conditions of one of the most difficult and remote of those regions in High Asia which (difficult and remote though they may be) have yet a practical interest to the supervisors of our political machinery. This particular region contains a political nut which must sooner or later be cracked by that machinery, and it is satisfactory to think that for once (thanks to Captain Deasy's indomitable perseverance) there is no geographical haze to obscure the cracking of it. The Pamir Boundary Commission settled a good deal of the Russo-Afghan boundary question, but it had nothing to do with the Russo-Chinese line of division which was closely connected therewith, nor did it decide where Kashmir (representing British interests) ends and China begins. Consequently Captain Deasy, in that portion of his work which covers this inaccessible no man's land, has geographically (as well as graphically) illustrated a corner of Asia which directly touches our political sensibilities on a somewhat tender spot. The political value of the book, therefore, is to a great extent concentrated in the map which accompanies it. This is no mere illustration of an adventurous journey selected from the great mass of incomplete mapping which already existed. It is a brand-new geographical representation of those districts wherein lies the trijunction of three great Empires, and, as such, it is an invaluable addition to our politico-geographical knowledge. The book tells us how the map was made, and, so far as it reveals the secret of Captain Deasy's success, it is well worth the attentive study of all amateur geographers who essay to fill in spaces between those outlines which have been already traced across the globe by the feet of pioneers of the past. The great network formed by the trodden paths of first explorers is rapidly reducing the size of its mesh, and the unfilled spaces require far more scientific effort on the part of practical geographers than did the old route surveys of bygone days. We owe much, therefore, to such scientific explorers as Sven Hedin and Deasy, who prove the advantage of careful preliminary study, and show us how possible it is, even under circumstances of the greatest difficulty, to retain a sound and well-assured basis of fixed positions whereon to hang the patchwork of their mapping. The text of the book (which is excellently illustrated) comprises a faithful account (a little too much in the "diary" form perhaps) of a long and patient struggle against difficulties of all sorts—difficulties of Tibetan officialism, of climatic unpleasantness, of sheer physical obstruction, of weariness and starvation. Captain Deasy waded through them all successfully, and has contributed a record at the end of his travels which comprises not only an interesting tale of adventure and

* 'In Tibet and Chinese Turkestan, being the Record of Three Years' Exploration.' By Captain H. H. P. Deasy. Fisher Unwin. 1901.

an excellent illustration of the extraordinary physiography of a most remarkable region, but also furnishes us with an outline of well-constructed and thoroughly sound geographical mapping which has earned for its author the highest distinction which the Royal Geographical Society can bestow.

T. H. H.

THE ANTARCTIC.

Mr. Bernacchi on the Southern Cross Antarctic Expedition.

Mr. Louis Bernacchi, who recently communicated to the Royal Geographical Society a paper on the scientific results of the *Southern Cross* Expedition, has given a fuller account of his experience on that expedition in a finely illustrated volume.* It gives a general account of the voyage of the *Southern Cross* and the wintering at Cape Adare, traversing the same ground as Mr. Borchgrevink's 'First on the Antarctic Continent,' but frequently containing valuable additions to our information, especially as regards the physical conditions of the ice and the nature of the rocks. Unfortunately, Mr. Bernacchi's somewhat hurried departure from this country in order to join the *Discovery* at Lyttelton prevented him from giving to the proofs the careful revision he had intended, and it is not unnatural in the circumstance that some slips have escaped correction.

If a criticism may be permitted, we would suggest that rather too much is made of the feelings and thoughts of the members of the expedition, and rather too little of the physical effects of the severe climate. Indeed, Mr. Bernacchi makes light of the discomforts of polar life, and neither he nor the majority of his companions seem to have suffered any injury from their exposure. It may be noted, however, that Mr. Hanson, the zoologist, died during the winter; Petersen, the first mate, died on the voyage home; and Dr. Klövstad, the surgeon, died soon after the return of the expedition—a mortality of three out of a total ship's company of thirty souls.

The full observations and working of the latitude and longitude taken by Mr. Colbeck at the farthest south point reached by Mr. Borchgrevink are given, and there is a short and interesting discussion of the methods of fixing latitude and longitude in the peculiar conditions of high polar latitudes. The methods of sledging are described in several places, and it is evident that the *Discovery* will be fortunate in possessing two men so experienced in sledge work as Lieut. Armitage and Mr. Bernacchi. It is unnecessary to refer to the author's original ideas as to the character of the great ice-barrier, as the earliest opportunity of putting them to the test will be afforded by the voyage of the *Discovery*, and until she has inquired into the question there are no data on which to found an argument.

The book is admirably illustrated. It contains a copy of Stanford's new antarctic map, a special chart of the route of the *Southern Cross*, and many useful diagrams. The photographs are very carefully selected; some of them are extremely beautiful, and give a vivid idea of the nature of the scenery of the ice-pack and of South Victoria Land.

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* 'To the South Polar Regions. Expedition of 1898–1900.' By Louis Bernacchi. Illustrated from photographs taken by the Author. London: Hurst & Blackett, Ltd. 1901.

MAP PROJECTIONS.*

Since the appearance of the last edition of the late Prof. Hughes' excellent little 'Treatise on the Construction of Maps,' now more than thirty years ago, no work has been published in this country of an exactly similar character, or that can be said to take its place, notwithstanding all that has been written on map projections of one kind and another. The more recent writers on this subject have, as a rule, dealt with some special projection, or if their works have been of a general nature, they have been either too elementary to be of much real practical value, or so advanced and elaborate that they are almost useless to those who are not highly skilled mathematicians. There has thus existed a long-felt need of a really good practical work on map projections which shall furnish all that is necessary for their construction, with clear explanations of the principles upon which they are based, expressed in language intelligible to one with a fair knowledge of mathematics, similar in character and scope to that already referred to, with certain alterations and additions as the lapse of time may have rendered necessary.

Mr. G. J. Morrison's little work to some extent meets this requirement, and it is the hope of the author that it will be of service "as a text-book to young students who do not require to go deeply into the subject, and as an elementary text-book to those whose profession requires them to master map projection in all its details, and to whom the more advanced text-books might at first be rather puzzling" (p. 110). To a certain degree there is no doubt that this will be the case, but it is to be regretted, from a practical standpoint, that it is not more complete on some important points, as it certainly might have been without any serious increase to the size.

The book consists altogether of one hundred and ten pages, and is divided into four chapters, the first of which is introductory, and deals with globes, maps, and map projections generally; the second is entitled "Map Projections considered popularly;" the third, "Map Projections considered mathematically;" and the fourth, "Projections of Small Areas." Chapters i. and ii. are necessarily elementary, although they contain some very sensible remarks, amongst which may be considered those on the importance of using globes for educational purposes; but in the two last chapters the student who is taking the matter up seriously, or the practical draughtsman, will find much that cannot fail to be of service to him. These deal in a more or less satisfactory manner with most of the projections in general use. The gnomonic projection is perhaps treated more satisfactorily here than in most works of the kind, and the method of construction is clearly described. This projection certainly deserves to be better understood and generally appreciated, for although, like all others, it has its drawbacks, yet it possesses the important feature that great circles appear upon it as straight lines. Charts of the oceans are now published upon this projection by the U.S. Hydrographic Department for laying down great-circle courses, which are afterwards readily transferred to the ordinary Mercator chart when it is required to do so. The stereographic projection comes in for a fair share of attention, although the method of construction might in some respects have been more clearly expressed, especially in the case of the projection upon the horizon of London (p. 53). Similar cases are given in other books, and many will doubtless consider that the method of construction usually

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* 'Maps: their Uses and Construction. A short popular treatise on the advantages and defects of maps on various projections, followed by an outline of the principles involved in their construction.' By G. James Morrison, M.I.C.E., F.R.G.S. London: Edward Stanford. 1901. *Price 5s. net.*

described is to be preferred to that which Mr. Morrison gives, and is certainly more intelligible. The stereographic projection has several excellent features, and the distortion is not greater than in many others. Its geometry is extremely satisfactory, and as all circles on the sphere are represented by either straight lines, circles, or portions of circles, it is comparatively easy of construction when its principles are understood. Many will therefore probably find it difficult to agree with the author when he states "that it is more of a mathematical curiosity than a useful map projection" (p. 83). At any rate, those who have occasion to deal with problems connected with mathematical geography have long since learnt to appreciate its good points.

Mercator's projection is somewhat summarily dismissed, and the explanation of the principle upon which it is based is disappointing; for although it is stated that "a little consideration" of the imperfect description given will show that the degrees of latitude vary practically "as the secants of the latitude" (p. 68), it would surely have been better to have explained clearly why this is so. Then, again, no table of meridional parts is given by which to construct this projection. This need not have occupied more than two or three pages, and would certainly have increased the value of the work from a practical point of view. However, the same remark applies to other tables which are necessary for the construction of the projections described, such as the table giving the value of a degree of longitude upon each parallel of latitude, which is usually given with such works. None of these need have been long, and certainly a dozen additional pages would have contained all that were necessary.

The account of the various modifications of the conical projection (pp. 70–80) is good so far as it goes, but it is far from complete, and nothing is said about the method of construction by diagonals, which is generally employed in maps for low latitudes, when the computed centre would fall at so great a distance as to render it practically impossible to describe a circle with compasses, and when curves of the radii are not obtainable. In connection with this projection, especially the table of the length of a degree of longitude on each parallel of latitude already referred to would have been a valuable addition, and enabled any one to construct it without having to refer to another work, which it will be now necessary to do.

The various forms of the elliptical projection might have been referred to, as some of these are useful for showing the physical features when it is desirable that the whole surface of the globe should appear on one map without the distortion occasioned by Mercator's projection.

In conclusion, however, it should be stated that Mr. Morrison's little book contains much useful information, and if in some respects it appears to be needlessly deficient, it is to be hoped that, in another edition which it may reasonably be expected will be called for before long, these deficiencies will be supplied, and the work rendered of more practical value than it is at present.

THE GERMAN ANTARCTIC EXPEDITION.

We have received an official communication from the Lords Commissioners of the Admiralty reporting the publication, in Germany, of an Imperial decree relative to the German South Polar Expedition. It is addressed by the Emperor to the Chancellor of the Empire, and is here reproduced as showing the status held by the German Expedition and its official recognition by the German Government. It runs as follows:—

"Dr. Erich von Drygalski, Professor in the University of Berlin, is appointed leader of the Expedition, which is to leave Kiel in August next, and proceed to the island of Kerguelen, where a magnetic and meteorological station is to be established. The journey to the south is then to be continued, the principal field of exploration being the Indo-Atlantic side of the South Polar Region. Should land be discovered which can be reached in this region, a scientific station is to be erected on it, and is to be kept going for a year if possible.

"The return journey should be attempted either in the spring of 1903, or, at latest, of 1904, as the leader of the Expedition may decide."

On the eve of the departure of the Expedition the following letter was addressed by Dr. von Drygalski to Sir Clements Markham, expressing his cordial wishes for the success of the work in which both nations are now engaged :—

"The *Gauss*, August 14, 1901.

"DEAR SIR CLEMENTS MARKHAM,

"The German South Polar Expedition cannot leave the mouth of the Elbe without once more sending its heartiest greetings and good wishes to yourself and the Royal Geographical Society, and through it to Captain Scott and the British South Polar Expedition. We thank you for the co-operation given to us throughout, and for the interest in our undertaking which you have shown in so high a degree, and which has frequently also taken practical shape in valuable help. We rejoice in the prospect of working in harmony with the British Expedition, and feel no doubt as to the result of this friendly co-operation. Good luck to the common labours throughout the whole undertaking; and to yourself and the Royal Geographical Society yet once more our hearty thanks for the cordial feelings constantly displayed, and our best wishes *auf Widersehen* when our work is accomplished!

"With best greetings,

"Ever yours truly,

"ERICH VON DRYGALSKI."

THE MONTHLY RECORD.

EUROPE.

The Limits of the Cotteswold Hills.—A circular has been issued by the Cotteswold Naturalist's Field Club asking for information, especially from those who have been long resident near the outlying parts of the Cotteswold hills, as to the extent of the area to which the name is applied by the inhabitants. In addition to general information on the subject, specific information is asked on the following points. (1) Are the outliers, like Chosen, Robin's Wood, Oxenton, and Bredon hills, considered as parts of the Cotteswolds? (2) What is the southern

boundary of the hills? Do they extend below Bath? If so, how much? (3) What is the south-east boundary in the direction of Chippenham, Malmesbury, Cirencester, etc.? (4) Is Wychwood Forest, and are the districts around Burford, Witney, Chipping Norton, etc., considered as parts of the Cotteswolds? If so, what are the limits of this Oxfordshire tract to the east and north? If not, what are the limits of the Cotteswolds in this direction? Definitions of the following terms are desired: Oxford Downs, Vale of Berkeley, Vale of Gloucester, Vale of Evesham, Vale of Moreton, Vale of the White Horse. Also the name or names of the country between Bristol, the Avon, and the Vale of Berkeley. The inquiry is not merely of local interest, but should be valuable from the wider point of view of the bestowal of popular names generally on natural features covering considerable areas. For the full elucidation of the question it would be necessary, if possible, to determine how far the present-day usage has sprung up in the neighbourhood itself, and how far the local usage of the past may have been modified by the influence of literature. This, however, would be a matter of considerable difficulty. It is to be hoped that the results of the inquiry may be made accessible to the public. Information is to be sent to the hon. secretary of the club above mentioned, Mr. S. S. Buckman, of Charlton Kings, Cheltenham.

ASIA.

Periodic Fluctuations in the Level of Central Asiatic Lakes.—In the ninth number of *Petermanns Mitteilungen* for the present year, Dr. Woeikoff discusses the question of the fluctuations of level of the lakes of Central Asia from the Sea of Aral to the Baraba, and seeks to compare the results which might be deduced with respect to a periodic variation of climate, with the hypothesis of Brückner on the same subject. He points out that recent Russian investigations, such as those of Berg on the Sea of Aral (*ante*, p. 86), have indicated as probable that the fall in the level of the lakes in question, which had been thought to be in progress down to 1899, has now given place to an upward tendency. The information obtained by Berg from the local fishermen, who gave the years 1894–98 as the period in which the most marked rise took place, seems trustworthy by reason of the importance to his informants of closely watching the changes of level in the interests of their occupation. Similar evidence of a recent rise was found by Ignatof in lakes Teniz and Kurgaldshin in the Akmolinsk province, though here a trustworthy standard of comparison with former times was wanting. The Kirghiz, however, stated that a rise in the lakes began about twenty years ago, and had been especially rapid within the last few years. Similar facts are recorded with regard to lakes Dengiz, Teke, and Kizilkak, as well as the lakes of the Baraba. Wishing to trace the connection between this phenomenon and the meteorological conditions in the region in question, Dr. Woeikof examined the records for the town of Barnaul, for which a longer series is available than for almost any other Asiatic station. He found that as regards rainfall a 55-year period (wet to dry $26\frac{1}{2}$ years, dry to wet $28\frac{1}{2}$) seems indicated. The first wet period, however, falls some 12 years earlier than Brückner's (1850), and 8 years after his dry period (1830); the dry period falls 4–5 years after that of Brückner (1860), while the second and most important wet period is some 13 years later than his, occurring at a time reckoned by him as dry. This 55-year cycle, which is some 20 years longer than Brückner's, seems to coincide with the fluctuations of the lake-levels. As regards temperature, the cycles seem much shorter even than Brückner's, and have apparently no decided influence on the fluctuations of the lakes.

Magnetic Survey of India.—It has lately been announced that the Indian Government has decided to carry out a magnetic survey of India on the lines

suggested by the Royal Society. In addition to the existing observatories at Bombay and Calcutta, others are being constructed at Dehra Dun, Kodaikanal, and Rangoon. The investigations will be carried out by the Survey and Meteorological Departments jointly, under the direction of Colonel Gore and Mr. John Eliot. Field work, to be commenced in Scind and the Punjab, will be directed by Captain Fraser, R.E.

The Survey of Ceylon.—In his report on the work of the Survey Department of Ceylon during 1900, Mr. Grinlinton states that the Topographical Survey covered during the year an area of over 4000 square miles, which largely exceeds that dealt with in any of the previous years since the organization of the survey. This is due both to the fact that there was on the whole less detail to insert, and to the experience gained in the past by the surveyors and officers. The areas dealt with were in the Trincomali district, the eastern part of the North Central Province, the part of the Eastern Province which extends from Trincomali towards the province of Uva, and the eastern or low country portion of Uva. In carrying out the survey, it is impossible, it is pointed out, to avoid missing both natural features and old irrigation works in a practically unknown country covered with dense vegetation, but it is believed that nothing of importance has escaped notice. Good progress has also been made with the trigonometrical work, the secondary triangulation of the south-east of the island being now completed, while work is being carried on in the north-west, by which it is hoped that a large gap in the work will be closed up. When this is done, only the north-east corner of the island will remain to be dealt with. Mr. Grinlinton prospected this in 1898, and found that it could only be carried out by a traverse. In addition to these surveys, cadastral work and various special surveys were executed, bringing up the total surveyed and mapped during the past four years to over 10,000 square miles, out of a total of 25,000. The special reports by officers on particular portions of the work contain matter of much interest. Thus Mr. Blair, in describing the survey of the Trincomali district, which dealt almost entirely with jungle-covered country, describes the remains of ancient irrigation tanks discovered in the now uninhabited block of 300 square miles between the roads from Trincomali to Anuradhapura and Dambulla. Many of these are in the basins of the Yan-oya and Pankulam-oya or Kal-aru rivers, by the water of which not a single field is now cultivated. The restoration of some of these is well worthy of consideration. Mr. Halliley describes the discovery of the site of an ancient town or stronghold on the top of Newaragala, close to Maha-oya, with a magnificent reservoir cut out of the solid rock, and measuring 80 feet by 50, with a depth of 5 feet, the labour of cutting which must have been enormous. A road, still the only means of access to the top, zigzags up the cliff with a uniform gradient secured by the construction in one place of a stone retaining wall, in others of a viaduct. On the three other sides the place is inaccessible even to monkeys. The report shows the progress of the survey by means of maps, and two comparative plans of Colombo are given, one from an eighteenth-century drawing received from the Hague, the other as it was in January, 1901.

Kozloff's Expedition in Central Asia.—We learn from *Petermanns Mitteilungen* that the report of a disaster to the Kozloff Expedition has happily not been confirmed. According to news received at the Russian Geographical Society from the Russian Embassy at Peking, Kozloff returned on June 26 to Tsaidam, where he found the depôt left by him in the previous year in good condition. From his winter quarters in the neighbourhood of Chiamdo, in Eastern Tibet, he had made his way by new routes to the lakes at the source of the Hwang Ho, which had been already visited by the expedition in 1900. The return journey

to Kiachta was to be begun early in August. Details as to the work done by the expedition in 1900 are given in the July number of *La Géographie* by M. Deniker, in continuation of the account noticed in the *Journal* for March last (p. 303), from letters addressed by the traveller to the Russian Imperial Geographical Society. In March the expedition started for Tsaidam, proceeding *viâ* Donkye to Koko-Nor. From Tsaidam, where a meteorological station was established, the expedition went south across the Burkhan Buddha range, which was crossed at an elevation of 14,800 feet. Lake Alik Nor was explored by means of a canvas boat, and found to have a depth of 100 feet. Animal life is very abundant on its banks. On June 19, the Amne Kor, the western extension of the Amne-machin of Prjevalsky, was crossed, after which the Orin Nor, or Russian lake, was reached at the point where the Hwang-ho makes its exit. This point is at the northern, not at the north-eastern, end of the lake. Kozloff traced the western shore to the point of entrance of the channel uniting it with the Charing Nor, while this latter was examined by Kaznakoff, who made almost the complete circuit of the lake. The two lakes are separated by a tract of hilly ground about 6 miles wide, and have high banks. The circuit of each is about 90 miles, and both contain several islands. The expedition then proceeded south to the upper Yangtse, which was crossed near Sogon Gomba, and at the time of writing his last letter Kozloff was at the village of Cherku, in about 33° N., 96° 20′ E., on the road from Sechuan to Lhasa.

AFRICA.

The Abyssinian Frontier Expeditions.—Majors Austin, Bright, and Garner, who left Omdurman in December on an expedition to Lake Rudolf, arrived at Mombasa early in September, after suffering great hardships during the journey. On the early portion of the route much swamp was met with, but on approaching Lake Rudolf the country became arid and deserted, and scarcity of water caused much difficulty. During the last two months the party subsisted almost entirely on the donkeys, and out of fifty-nine Sudanese only fourteen survived. Some good survey work was, however, done between the Sobat and the lake. Major Gwynn has also continued the survey of the frontier northwards from the Blue Nile, and the whole has now been mapped in detail, and a definite frontier line adopted.

M. Le Roux in Abyssinia.—A French explorer, M. Hugues le Roux, has lately returned to France from an expedition, undertaken early in the present year, to the western borders of Abyssinia, where he is said to have made discoveries of some importance. From Addis Abbaba he seems to have journeyed to Wallaga in company with Major Gwynn, but when that officer proceeded to Khartum, M. Le Roux undertook the exploration of the region of the Blue Nile. Descending the steep escarpment of the highlands, he reached the confluence of the Didessa and Blue Nile, the latter of which he states has hitherto been confounded with one of its tributaries, flowing in reality a degree further south than has been supposed. From this it would appear that the Abai must make a still greater bend to the south (below the points at which it was seen by D'Abbadie and Cecchi) than was shown in the map by Mr. Oscar Crosby, published in the July number of the *Journal*.* The whole section of the stream from the frontier of Gojam to the confluence of the Didessa was surveyed by M. Le Roux.

British South Africa.—A report has lately been issued by the British South

* The latitude of the Abai at this part of its course has been hitherto given as about $10\frac{1}{2}°$ N. Mr. Crosby placed the southernmost part of the newly discovered bend just north of 10°, or less than half a degree south of the course as formerly given. If M. Le Roux is correct in shifting it a degree south, it must approach very near, if it does not join, the Angar, hitherto supposed to join the Didessa above its confluence with the Blue Nile.

Africa Company on the administration of Rhodesia in 1898–1900, which presents a large amount of information on the recent progress and present position of affairs in that territory. In spite of the drawbacks caused by the war in South Africa, the two years under review have been marked on the whole by steady progress, and the report, which occupies nearly 400 pages, permits a clear idea to be gained of the advance which has been made by the introduction of settled administration together with roads, telegraphs, postal facilities, and the like. Especially welcome is the information respecting the outlying portions of the territory in North-Eastern and North-Western Rhodesia, in which the past three years have been a time of particularly rapid development. Maps of both these are given, showing the stations at present occupied, the post and telegraph offices, the roads and footpaths, and in the case of North-Eastern Rhodesia, the administrative divisions (districts) of the territory. In this latter a total of 840 miles of road has been made, the principal lines being the Stevenson road and its continuation to Mweru and Kazembe, with the branch roads from Fife to Kasama (headquarters of the Awemba district) and Mirongo between the upper Chambezi and the Loangwa; and the roads from Fort Jameson west to the Loangwa and south to the Portuguese frontier.* The postal service extends to nearly every portion of the territory. Ox transport has been introduced with complete success on the Tanganyika road, but it is only here that the conditions are yet entirely favourable. Mr. Codrington, the administrator, gives notes on the present condition of the native tribes, the total number of individuals being placed by a very rough estimate at 256,000. A marked improvement has set in in the Awemba country since the suppression of the native *régime* of massacre and mutilation. A complete change is said to have come over the character of the people, who seem likely before long to become industrious workers. The influence of the Arabs in the territory has now dwindled to absolute insignificance. The health of Europeans has of late been remarkably good, especially in the district around Fort Jameson. In North-Western Rhodesia six stations have been established, including one at the Victoria falls, which, under the name of Livingstone, will be the future headquarters of the Administration. Health conditions promise here, too, to be favourable. The postal routes cover a large part of the territory, and their extension to the remote camp at the source of the Kafue was contemplated. Rubber is the most valuable product, and much information as to the rubber trade was gleaned by Major Colin Harding, extracts from whose reports on his journeys to the headwaters of the Zambezi are given. In Southern Rhodesia, to the industrial progress and resources of which a special section is devoted, European cultivation has made a decided stride. Wheat has been tried experimentally, with success, in each district, and other promising crops are barley, oats, potatoes, tobacco, etc. Tea has been planted in the Melsetter district (south of Manica), and a company has been formed to start rubber plantations in the Sabi valley. Steps have been taken to plant trees throughout the country, and the reports are so far very satisfactory. A special report on the rubber industry, by Mr. Lyttelton Gell, which has also been printed separately, is included. It strongly urges legislation for the regulation and protection of the industry. Much progress has been made with the development of the system of roads, which has already reached a total of 2734 miles. Lastly, reference must be made to the official system of spelling of native names, which, though not quite consistent throughout,† will be of much use as tending to secure uniformity.

* An extension of the last to Tete is contemplated.

† *E.g.* we find N*c*ozana and N*k*unzane, *U*mguza and *M*guzana, M*c*habezi and M*tsh*eleli, Ngezi and Zambesi. Among the forms adopted are Bulawayo, Matobo (hills), Kafukwe (river), Basutu, Matabele (tribes).

Explorations on the Northern Frontier of French Congo.—An expedition under M. Lesieur, some details respecting which are given in the August number of *La Géographie*, has introduced considerable modifications into the map of this part of West Africa, which has been known chiefly through the work of Crampel and Fourneau. The Campo, which in its lower course divides the Spanish territory from the Kamerun, has been shown to be identical with the Temboni of Fourneau, and the Ntem of Crampel, the latter of which names is in use by the natives during its whole course. The Kune of Crampel is its largest tributary. Its banks are high, and its course obstructed by rapids, so that it is useless as a means of access to the interior. The Benito (which has hitherto been supposed to receive the Ntem, or Temboni) is in reality a much smaller stream than the Campo. Its name Eyo has, since the dwellers on its banks have been driven seawards by the Fans, given place to that of Welen (Welie of Crampel). It too is useless for navigation. The Aina, or Ivindo, rises at a spot not far from the point where it was crossed for the last time by Crampel. It flows first north, then east, and finally, before joining the Ogowe, S.S.W. Its banks are often swampy. The Ja, which was reached by Crampel in 1888, at the northern limit of his route, at the village of Jambong, is placed much too far north on our maps. It passes from French to German territory, but re-enters the former, and finally joins the Aina under the name Jadie, as seen by Fourneau. The identity of the Ja and Jadie was affirmed by all the natives, and if this is correct the Ja, and not the Mayanga (of Fourneau), will be the main stream. The Ja is even said to be the main headstream of the Ivindo, being of more importance than the Aina.

Exploration of the Bali (French Congo).—M. Fondère has lately sent to the Paris Geographical Society a short account of an exploration of the Bali river by MM. Frédon and Cadenat, acting under his orders. The precise position in the Congo system of the Bali, the upper course of which has been known for some time through the journeys of Ponel, Perdrizet, and other travellers, has been a disputed point among African geographers, the theory having been suggested by M. Wauters that it belonged to the system of the Ubangi, while others regarded it as the upper course of the "Likuala aux Herbes." The probability of the latter view was decidedly shaken by the work of M. Jobit (*Journal*, vol. xvii. p. 73), and the contention of M. Wauters has now been sustained by the journey above alluded to. On January 3, 1901, MM. Frédon and Cadenat left Bania on the upper Sanga and struck east, reaching the Mbaere, a right-bank tributary of the Bali, on the 15th. This stream had a width of 35 yards, with a maximum depth of 10 feet, swampy banks, and a current of about 4 feet a second. The Bali was struck at the village of Bassali, where its width was 85 yards. It flowed amidst a chaos of granite rocks, but although everywhere obstructed by rapids, it was found possible to navigate it in canoes. Its course veered to the east, and thirty-nine days after the departure of the expedition the explorers found themselves at Loko, the highest point reached by Vangele on the Lobai, a tributary of the Ubangi. M. Fondère says that his recent surveys have confirmed the opinion of M. Jobit, as to the slight importance of the upper "Likuala aux herbes," which is merely the outlet of an almost inaccessible region of marshes. They have also enabled him to construct an improved map of the region between the Ubangi and Sanga, in which the geography as shown on former maps is entirely modified.

AMERICA.

Physiography of Eastern Canada.—An important study of the history of the development of the present surface features of New Brunswick and Nova Scotia (Acadia) has lately been made by Prof. R. A. Daly, who puts forward his

views as to the stages of that development in the *Bulletin* of the Museum of Comparative Zoology at Harvard College (Geol. Series, vol. v. No. 3). The writer begins by pointing out the essential unity of the Appalachian geological system, as regards axial trends, composition, and structure. By the labours of Davis and others, it has also been shown that the forms of sub-aërial erosion present remarkable analogies in New England, in the New Jersey-Pennsylvania region, and in the southern Appalachians, though hitherto the same parallelism has not been shown to extend to the Acadian portion of the system. In the present paper, therefore, Prof. Daly examines the question by a study of the erosion forms in Nova Scotia and adjacent portions of New Brunswick. He first describes the great topographic facets of the southern plateau and the southern New Brunswick highlands, and after considering the three hypotheses by which the erosion of such a region has been explained, concludes that these facets represent a peneplain of Cretaceous age, which has been deformed by arching and tilt, and modified by sub-aërial and glacial erosion, and by an intermediate drowning of the shore-line. Coming next to the lowlands, about the Bay of Fundy and in Central New Brunswick, he finds in these traces of a second peneplain of Tertiary age, which has likewise been subject to extensive modification, which is being continued at the present day by tidal scour and other agencies. Thus in both of the two main topographic features of Acadia, he finds that "the denudation was essentially sub-aërial, and referable to two chief cycles of geographic development." Finally, he endeavours to show by a table the striking parallel which can be drawn between the physiographic features of Acadia and New England, and which brings us a step nearer the establishment of the organic unity of the whole system from Georgia to the Gulf of St. Lawrence. The paper is illustrated by photographs showing clearly the main physiographic features of the country.

The Highest Summit of North America.—We have already referred (*Journal*, vol. xi. p. 70; xiii. p. 305) to recent American explorations on the head-waters of the Shushitna river, which have revealed the fact that the high peak towering among the mountains to the north is probably the highest summit in the whole of North America. Mr. Dickey, a prospector, who was the first American to obtain a sight of the peak, estimated the height as over 20,000 feet. While identifying it with the old Mount Bulshaia (Big mountain) of the Russians, Mr. Dickey christened the peak Mount McKinley, a felicitous choice, which will worthily commemorate for all time the murdered President of the United States. In a map given in the *Journal of the American Geographical Society* for 1898, to illustrate explorations carried out in 1897, the height was estimated, from data obtained by Mr. Eldridge of the U.S. Geological Survey, at 19,500 feet. This has since proved too low a figure, for during the summer of 1898 a careful triangulation was carried out by Mr. Robert Muldrow, during a new expedition of the Geological Survey. Mr. Muldrow describes the operations, with a sketch-map showing the position of the mountain and the angles observed, in the August number of the *National Geographic Magazine*. For the purpose of measurement, a stadia line was run up the Shushitna river, elevations as well as directions being determined by a transit instrument reading to minutes. From points on this line six angles for location and elevation were obtained upon the mountain, giving for the height figures varying from 20,069 to 20,874 feet, the weighted mean and adopted height being 20,464 feet. The position obtained was lat. 63° 5′ N., long. 151° 00′ W., the distance from the nearest point of observation being 43·4 miles.

The Length and Parallelism of South American Coasts.—Dr. Theodor Arldt has drawn on a Mercator's map the loxodromic lines between the outstanding or primary points of the South American coast, which he calls the principal coast

directions, and calculated their length and the angles they make with the meridian. He has repeated this for secondary and still minor prominences, and compared this distance from point to point with the total length of the coast between them, with the mean result that the coast is 1·4 times the distance from point to point. The whole coast-line amounts to 22,218 miles, which is over 2·4 times the minimum possible perimeter of 9110 miles. Dr. Arldt also calculates what he terms the parallelism of these point-to-point lines, denoted by P below, which he defines as the ratio between the sum of their projections on the lines between outstanding or primary points and the sum of their lengths. The coastal parallelism, denoted by Π below, he obtains by comparing the sum of the projections of these point-to-point lines divided by their ratio to the total coastal length between the points, with the sum of the point-to-point distances. This is naturally less than the former. He further calculates the deviation of the mean direction of the point-to-point lines from that of the lines joining the outstanding points; it is denoted by Δ' below. A comparison between coastal directions and those of the chief ranges, valleys, and the 100-fathom line is made. The following table summarizes the results, which are published in the *Mitteilungen des Vereins für Erdkunde zu Leipzig*, 1900, pp. 27–115:—

Type.	L = length measured from point to point.	D = average distance from point to point.	K = total length of coast.	G = ratio of total length of coast to point to point length.	P = parallelism of coastal directions.	Π = parallelism of coasts.	Π' = ratio of parallelism of coast to parallelism of average coastal directions.	Δ' = mean deviation of angle mean coast makes with the meridian, from that made by chief coastal directions.
	Miles.	Miles.	Miles.					
Longitudinal west coast, Pacific type	5914	39·8	8716	1·45	0·86	0·62	0·71	2·5
Transverse coast, Andean region in Goajira and Argentina	2835	61·6	3843	1·36	0·72	0·56	0·79	7·5
Longitudinal coast, Atlantic type, in Venezuela and Brazil ...	4708	67·2	6129	1·31	0·82	0·69	0·83	20 5
	7543	65·0	9972	1·32	0·78	0·64	0·82	15.5
Transverse coast of Guiana	2456	91·0	3530	1·44	0·89	0·66	0·73	4·0
Total Atlantic type, = East coast	9999	69·9	13,502	1·35	0·81	0·64	0·80	12·5
All South American coasts	15,913	54·5	22,218	1·39	0·83	0·64	0·77	9·0

AUSTRALASIA AND PACIFIC ISLANDS.

Prof. Baldwin Spencer's Expedition.—*Nature* quotes from the *Victorian Naturalist* the statement that on July 19 last, Prof. Baldwin Spencer announced that he had finished his work at Barrow creek, where six weeks had been spent

among the Kaitish and Ummatjera tribes, and was purposing to form the next main camp at Tennant's creek, about 150 miles further north. A large amount of ethnological material had been secured.

The Capital of the Australian Commonwealth.—In framing the constitution of the new commonwealth of Australia, the question of the future capital was, it will be remembered, left unsettled pending the thorough investigation of the suitability of the various sites, on behalf of which a claim for the honour might be put in. The inquiry was placed by royal commission in the hands of Mr. Alexander Oliver, President of the Land Appeal Court of New South Wales, who has since presented his report on the subject. By the Commonwealth of Australia Constitution Act, it was laid down that the seat of government should be in territory granted to or acquired by the commonwealth and in New South Wales, not less than 100 miles from Sydney, if that colony should become an original state. The territory in which such seat of government might be situated was to contain an area of not less than 100 square miles. Ambiguities in the interpretation of this section of the Bill caused preliminary difficulties, among them being the uncertainty whether the 100 miles was to be measured by the nearest road or in a direct line. These, however, were got over in time, and proposals from places in New South Wales fulfilling the required conditions were invited by advertisement. An unexpectedly large number of responses were elicited, no fewer than forty applications being received. Of the sites put forward, twenty-three were inspected, some of them as many as three times, while at fourteen sites public inquiries were held. Before stating the conclusions arrived at, Mr. Oliver sketches the conditions and considerations by which it seemed that the choice should be determined. Some of the principal were: (1) Position with regard to the denser populations of the colony, which was held to exclude sites north of the main western line; (2) accessibility, as determined by the three principal lines of railway south of the same line; (3) the possession of adequate sources of water-supply; (4) the presence of suitable climatic conditions, *e.g.* an equable temperature, bracing air, and exemption from moist sea-breezes; (5) the suitability of the ground for the building of a beautiful and commodious city. The claims of the various applicants are passed in review, and the following conclusions arrived at: Either of the three sites, Orange (or Canobolas), Yass, or Bombala-Eden (Southern Monaro), would be suitable for the required purpose. If the final selection is to be governed by considerations of cost of acquisition and present accessibility as between New South Wales and Victoria, Yass would take the first place, but the water resources here are not as satisfactory as could be desired. If soil and climate are regarded as controlling factors, Orange (or Canobolas) has the advantage, but the position of this is less favourable as regards cost of purchase, water-supply, and accessibility. Apart from cost and present accessibility, Southern Monaro combines more distinctively appropriate features than either of the others, and if regard be paid chiefly to the future, is entitled to take the first place. A separate volume of plans accompanies the report.

POLAR REGIONS.

The "Discovery."—The *Discovery* arrived at Cape Town on October 3, having *en route* touched at South Trinidad island, where, after some difficulty on account of the surf, a landing was effected by Captain Scott, Mr. Murray, and Dr. Koettlitz, who reached an altitude of over 1000 feet, and made an interesting collection of natural history objects. The ship afterwards proceeded to Simon's bay, whence, on October 14, she sailed for Lyttelton, N.Z., the proposed visit to Melbourne having been abandoned.

The Scottish Antarctic Expedition.—A statement as to the plans now adopted for the Scottish Antarctic Expedition was made by Mr. W. S. Bruce, the organizer and leader of the expedition, at the recent meeting of the British Association at Glasgow. Mr. Bruce last year sketched a preliminary scheme in the *Scottish Geographical Magazine*, according to which the expedition was to have extended over three years, while the programme included a wintering station in a high southern latitude. This has since been considerably modified. Funds have been subscribed, entirely by Scotsmen, sufficient for one complete year's work in the antarctic, but the idea of a winter station has been given up for various reasons. A free moving ship, constantly doing work on *Challenger-Valdivia* lines during a whole year, is, Mr. Bruce thinks, the greatest present need. Contours of land-areas will be determined, and geological, zoological, oceanographical, and meteorological research will be actively pursued during the whole voyage, while special land journeys of short duration will be undertaken as occasion arises. The outward route will be that indicated last year, viz. one passing from the Falkland islands to the south of South Georgia, and striking south in about 30° W. across the Weddell sea. Here it is hoped to push southwards as far as is prudent without involving the risk of the ship being caught in the ice. Much importance will be attached to meteorological work, and stations in South Georgia and the far south will, if possible, be established. The Sigsbee and Lucas sounding-machines will be taken on board, and a special examination will be made of the region about 68° 34′ S., 12° 49′ W., where Ross obtained his much-disputed sounding of 4000 fathoms and no bottom. The extent of the great deep discovered by the *Valdivia* between Bouvet island and Enderby Land will also be a subject of investigation. On board there will be a permanent scientific staff of 5 men, and the marine biology of the antarctic, as well as all the observations essential to an oceanographical expedition, will receive careful attention. Mr. Bruce intends to purchase a Scottish or Norwegian whaler of about 500 tons, and hopes to start in about September, 1902.

The Peary Expedition.—Extracts from the journal of Mr. H. L. Bridgman during the voyage of the *Erik* to Peary's headquarters in the far north, are printed in the Brooklyn *Standard Union* of September 29. The quotations are somewhat disconnected, so that it is somewhat difficult to obtain a complete outline of the events of the voyage, but the following particulars supplement the accounts previously published. The *Erik* had on the whole a fair passage across Melville bay, though on two occasions the advance was all but given up, owing to obstruction by the ice. At Cape York, which was reached three days after leaving Upernavik, the first tidings of the *Windward* and her crew were obtained, it being ascertained that the ship had wintered in safety on the west side of Smith sound. The meeting seems to have taken place during Peary's absence at Olrik's bay, to the neighbourhood of which Mr. Bridgman, to judge from the fragments of his journal published, proceeded in the *Windward* for the purpose of hunting caribou, which abounds on the peninsula between Olrik's bay and Academy bay. Here communication was opened with Peary on or about August 19, though whether this was the first occasion on which the parties had met is not made clear. Since the arrival of the *Erik*, as announced in our last number, the *Windward* also has arrived in southern waters, having put in at Brigus, Newfoundland, on September 26. She will sail again next year on her final voyage north in connection with the present expedition.

Baron Toll's Expedition. — According to news printed in *Petermanns Mitteilungen*, there seems a probability that Baron Toll may be forced to modify in some degree the programme of his expedition, owing to the partial failure of his

coaling arrangements. The Baron was obliged to push on last autumn from Jugor strait without waiting for the coaling-ship, and it is doubtful whether his supplies will allow him to push on to Sannikoff land, to winter there, and return *viâ* the Pacific. Lieut. Kolomeizeff reached Yeneseisk early in the summer, on a mission for the establishment of coal depôts at Dickson harbour at the mouth of the Yenesei and on the New Siberian islands, from which it appears that the Baron wishes to keep open a line of retreat to the west. Lieut. Kolomeizeff only succeeded in reaching the mouth of the Yanesei from the winter quarters on the third attempt.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Distribution of Volcanoes.—Since the map in Berghaus' atlas was prepared, many new discoveries, especially in Central Africa and Asia, have made a revision desirable. Dr. C. W. Wägler has published in the *Mitteilungen* of the Leipzig *Verein für Erdkunde* for 1900 two maps, showing the Pacific and its complementary hemisphere on a mean scale of 1 : 31,000,000, with the network drawn according to an "external stereographic" projection. On these he distinguishes volcanoes active in the nineteenth century, from those active within historic times, and from others, indicates fumaroles, mofettas and solfataras, mud volcanoes, geysirs, and hot springs as far as they can be shown on the maps, and marks the distribution of recent volcanic outpourings. He divides the world into (1) the Pacific basin; (2) the Indian-Antarctic basin; (3) the Atlantic area, round whose borders the volcanoes are grouped; and further subdivides these into minor basins. The letterpress accompanying the maps is rather scrappy. No tabular summary of the different kinds of volcanoes is given. The lists given in the text are usually fuller than the map, which, of course, is necessitated by the small scale of the latter. The South Pacific coast from Victoria Land to Graham's Land yet to be explored may have volcanoes, and in other parts of the world others may yet be discovered.

Geological Evidence for a South Pacific Continent.—Carl Burckhardt, one of the exploring geologists attached to the Muséo de la Plata, has recently contributed a paper to the Revista of the Museum (vol. x. pp. 177 ff.) on this subject. He points out that between 32° and 39° S., the Chilean slopes and main crest of the Andes are formed of porphyritic conglomerates belonging to Upper Jurassic and perhaps in places to Cretaceous times, and are succeeded to the east by a belt of fine-grained sandstones and marls of exactly the same age as the conglomerates farther west. He considers that the latter indicate the presence of deeper waters, and the former the proximity of the western shore of the Upper Jurassic Andine gulf, which was bounded on the west by a continent whose eastern coast almost coincided with the present western coast of Chile. This continent he thinks long persisted, probably from the Devonian epoch, and may have extended to New Zealand and Australia, and this is supported by palæontological evidence, not merely in the similarities of the *glossopteris* floras, but also in the similarities of the recently studied plants of the Rhætic beds of these two now widely separated regions.

A New Formula for the Rate of Currents in Rivers.—At a recent meeting of the professional section of the Vienna Institute of Architects and Railway Engineers, Mr. Richard Siedek, of the Government Hydrographic Bureau, proposed a new formula for determining the speed of the current in rivers. The formula of Ganguillet and Kutter, which has been largely used since its introduction in 1877, has proved unsatisfactory when compared with the results of direct measurement by refined modern methods; discrepancies of as much as 60 per cent. having been recorded. Siedek has made use of much more ample material than Kutter had at his disposal. According to Dubuat's law, the power

producing the current in streams and channels depends solely on the slope of the surface, and opposed to this is the cross-section resistance of the bed of the channel. The new results indicate that the relation between the resistance and the velocity of the stream is nearly constant, and Siedek accordingly does not assign special coefficients of friction or resistance, as these are included in the assumed relations of slope and mean depth. In defining the cross-section of the stream, Siedek takes into account, besides the mean depth (T), the breadth at the surface of the water (B). This avoids the defect of Kutter's "Profile radius," which gave the same numerical values for, *e.g.*, a stream 9 feet deep and 12 feet wide and a stream 6 feet deep and 18 feet wide, and it embodies the results of the observations on the Elbe and Danube (1881), showing that with the same slope the current is faster the greater the depth. Since under normal conditions the breadth and depth of a river tend to increase as the slope diminishes, a given normal breadth (B) corresponds to a given normal depth (T) and slope (I), and the fundamental equation for the speed V′ of a normal stream becomes—

$$V' = \frac{T\sqrt{I}}{\sqrt{B}\sqrt{0·001}}$$

When the conditions are not normal, the effect of abnormality in any one factor on each of the others must be allowed for. This can be best expressed in the form of corrections of the value of V′. Siedek's final formula for velocity V is as follows:—

$$V = V' + \frac{T - T_n}{\alpha} + \frac{I - I_n}{\beta(I + I_n)} + \frac{T_n - T}{\gamma}$$

when T_n and I_n are the "normal" values corresponding to B, and α, β, γ are coefficients, the values of which are given in tables, depending on the actual slope and depth. One distinct advantage of Siedek's formula is its applicability to open or flood profiles, which do not require special computations as in the case of Kutter's expression. The accuracy of the new formula has been tested by comparison with 537 direct measurements on the Danube, Rhine, Elbe, Rhone and tributaries, and on tributaries of the Volga. The agreement is on the whole very satisfactory, the differences ranging from less than 5 cms. (2 inches) to a maximum of 20 cms. (8 inches) per second, and becoming less the wider the stream, partly because normal conditions are more nearly realized, and partly because the errors of measurement are relatively smaller. Further comparisons are in progress. At the end of his paper Siedek urges that a formula, however good, should only be used in cases where direct measurements are impossible. The paper appears in the *Zeitschrift des Oesterichischen Ingenieur- und Architekten-Vereins*, 1901, 23 and 26.

GENERAL.

New Geographical Publication.—The Geographical Association has issued the first number of a magazine devoted to the study of methods of geographical teaching, which has been for some time in contemplation. It is edited by Mr. A. W. Andrews and Dr. A. J. Herbertson, and will appear three times yearly, in February, June, and October. The magazine will be addressed primarily to teachers of geography, and besides discussing class-room and open-air methods of teaching, will contain articles on such subjects as ordnance maps, typical regions of the globe, especially in the British dominions, the great cities of the empire, and the various colonies. Geographical literature, maps, and appliances will also be reviewed from the teacher's point of view. The paper should prove of great value,

nothing of the kind having as yet been issued in this country, while in the still imperfect state of organization of geographical teaching, teachers are too often dependent on their own resources in carrying out their work. We hope, therefore, that the new venture will receive such support as may place it on a secure and permanent basis. The title of the magazine is *The Geographical Teacher*. It will be issued free to members of the Geographical Association, while by means of a guarantee fund raised mainly by members of that body, it is found possible to offer the magazine to the public at one shilling per copy. The first number is issued for October of the present year.

International Geographical Congress.—It is announced in the *National Geographical Magazine* that an acceptance of the invitation extended by the National Geographic Society to the International Geographical Congress, for its next meeting, has been received at Washington from Baron von Richthofen. The meeting will take place in 1904, and will be the first held outside Europe.

OBITUARY.

Lieut.-Colonel Seymour Vandeleur, D.S.O.

ANOTHER of the most promising workers in the field of African survey has fallen a victim to the Boer war in the person of Lieut.-Colonel Seymour Vandeleur, whose excellent work both in East and West Africa is well known to readers of the *Geographical Journal*. Like Captain Wellby, whose loss to the cause of geography we had to deplore last year, Colonel Vandeleur had shown himself a most zealous and painstaking surveyor, never allowing his interest in his work to flag even amidst the arduous conditions of a military campaign. It is with this side of his work that we are more particularly concerned as geographers, but the exceptionally rapid promotion which he gained during his twelve years' service in the army is a clear indication of the value set upon his services by the military authorities.

Seymour Vandeleur, eldest son of Hector Stewart Vandeleur, of Milrush and Cahiracon, County Clare, Lord-Lieutenant of that county, was born on July 11, 1869. From 1879 to 1882 he was educated at Farnborough School, whence he passed to Eton, entering the army class there, and afterwards passing straight to Sandhurst. He entered the Scots Guards in 1899. During the winter of 1893 he made a shooting tour in Somaliland and Abyssinia, and in the following year was seconded for service on the staff. He now found scope for more extended work in Africa, receiving an appointment under the Foreign Office in Uganda, whither he proceeded towards the end of 1894, remaining nearly two years, and taking part in the Ungoro, Nile, and Nandi expeditions. During the whole of his journeys he carried out extensive surveys, which for the first time supplied a fairly accurate basis for the detailed mapping of Uganda and neighbouring countries. He described his work to our Society in November, 1896, and in the following year its value was recognized by the award of the Murchison Grant. From Government he received the East African medals and clasps, together with the Distinguished Service Order.

Lieut. Vandeleur had not been many months in England when he received a new appointment, this time in West Africa, where during the winter of 1896–97 he was engaged in the military operations against the Sultans of Nupe and Ilorin, being again mentioned in despatches, and receiving the West African medal and clasps with the brevet rank of major. At the close of 1897 he was suddenly summoned to Egypt, where he served till 1899, being present at the battles of the Atbara and Omdurman, at the former of which he was slightly wounded. After a short period of service as A.D.C. to Lord Methuen, then commanding the Home

District, he went out to South Africa, where he was employed on special service, and received promotion as Deputy-Assistant Adjutant-General. He was severely wounded at Middelfontein, in January, 1901, and, being mentioned in Lord Roberts's despatches, was promoted to the rank of lieut.-colonel. He came to England on leave in the early summer of the present year, but returned to South Africa, and was killed at Waterval, on August 31, when on his way from Pretoria to Pietersburg to take over Colonel Grenfell's command. He had been transferred to the Irish Guards on the formation of the regiment in October, 1900.

Besides the papers printed in 1897 in the *Journal*, Colonel Vandeleur published, in 1898, a work entitled, 'Campaigning on the Upper Nile and Niger.'

General M. I. Venukoff.

The well-known Russian geographer, General Michael Ivanovich Venukoff, died in Paris on August 1 last, at the age of sixty-nine years. The deceased was born on July 5, 1832, at Nikitinskoye, in the Riazan government, and received his military education at what is now the Constantine Artillery School. He afterwards entered the Imperial University of St. Petersburg, and after completing his studies, travelled extensively in Russian Asia and adjoining regions, including the Amur, the Tian-Shan, Altai, and Caucasus (1857–1863). He subsequently undertook various journeys in other parts of the world, visiting at one time or another China, Japan, Asiatic Turkey, Algeria, Tunis, Senegal, Brazil, etc., spending some time in China and Japan in 1868–69. He was a copious writer, his publications including both books and articles in scientific and other periodicals. Of the former, the most important was, 'Travels on the Confines of Russian Asia,' published in Russian in 1868. General Venukoff had resided in Paris for some years before his death. He had been an Honorary Corresponding Member of our Society since 1886. A short sketch of his life, with portrait, appears in the *Deutsche Rundschau* for October.

Jakob Erhardt.

The veteran East African missionary, Jakob Erhardt, one of the zealous band by whose labours public attention was first directed, more than half a century ago, with results of such far-reaching importance, to the interior regions of Eastern Equatorial Africa, died in August last at Stuttgart, at an advanced age. Erhardt was associated with Krapf and Rebmann in the work entrusted to them by the Church Missionary Society, which commenced operations in East Africa in 1843, and he actively participated in their labours for a number of years. During their intercourse with the natives of the coast region and the Arab traders then pushing into the interior, the missionaries, as is well known, collected many reports on the geography of those mysterious regions, and it was to Erhardt that was due the first attempt at a cartographical representation of the facts which had been gleaned. This was published in the *Church Missionary Intelligencer* for 1855, and soon attracted wide attention. Rumours had reached the ears of the missionaries of the three great lakes of the interior, Nyasa, Tanganyika, and the Victoria Nyanza; and by combining these into a single lake, Erhardt obtained a huge inland sea of singular outline, which, if it had really existed, would have dwarfed the proportions of all the other freshwater lakes of the globe. It was to the interest aroused by this publication, which was repeated with some modifications in the second volume of the then newly started *Petermanns Mitteilungen*, that the ultimate despatch of the great expedition of Burton and Speke was largely due. Erhardt has long outlived his brother missionaries, Rebmann having died in 1876, and Krapf in 1881.

Prof. Josef Luksch.

On July 29 of this year there died at Brunn-am-Gebirge, near Vienna, the well-known physicist and oceanographer, Regierungsrath Prof. Josef Luksch.

The son of an artillery officer, Josef Luksch was born at Graz in 1836. He was educated at a military academy at Wiener Neustadt, and served on the active list from 1855 to 1866—after 1862 in the navy. After his retirement in 1866, he taught geography and history at the Royal Naval Academy at Fiume. In 1870 he resigned a post as examiner at the Vienna Technical School, and thereafter became professor at Fiume, retaining the chair till 1894. Prof. Luksch began oceanographical work in 1874 with an investigation of the waters of the Dalmatian coasts. This was followed by researches in the open waters of the Adriatic, and then came the great expeditions of the *Pola* in the eastern Mediterranean, the Ægean sea, and the Red sea. Geographical science is indebted to him for the examination of the depths and configuration of the bed of those seas, and for the collection of abundant data regarding the temperature and salinity of their waters. Luksch's special work, however, was the investigation of the optical properties of sea-water, which was remarkable not only for the abundance of the material discussed, but for the variety and accuracy of the methods employed. In 1879 Luksch published a map of the world showing the progress of discovery, and in 1882 he edited the oceanographical observations of the Austro-Hungarian Expedition to Jan Mayen. Many papers on his own observations are to be found in the publications of the Vienna Academy of Sciences.

Prof. Wilhelm Tomaschek.

Dr. Wilhelm Tomaschek, professor of historical geography at Vienna University, died suddenly of heart disease on September 9. Born at Olmütz, in Moravia, on May 26, 1841, he received his education at Vienna, becoming first teacher at the gymnasium, and after 1877 professor of geography at the University of Graz. In 1885 he was summoned to the chair of geography at Vienna University. Prof. Tomaschek's scholarship in the direction of philology and history was of a high order, and justifies a comparison of the Austrian *savant* with the late Heinrich Kiepert, though the former lacked the acquaintance with places at first hand and the qualifications as a cartographer possessed by the latter. His writings, for the most part published in the *Transactions of the Vienna Academy of Sciences*, were chiefly concerned with the historical geography of Western Asia and the Balkan peninsula. Among them may be cited his 'Topographical Commentary on the Voyage of Nearchus,' his contributions to the 'Historical Topography of Asia Minor during the Middle Ages,' his papers on "Sasun and the Source-Region of the Tigris," and on "Our Knowledge of the Hæmus Peninsula," and other writings of greater or less length.

CORRESPONDENCE.

Joris Carolus, Discoverer of Edge Island in 1614.

To my article under the above title, which appeared in the June, 1901, number of the *Geographical Journal*, the following facts should be added :—

In the Doge's Palace, and also in the Correr Museum at Venice, there are preserved two pairs of globes. Both (according to the signature on the celesti

globes) were made by "Guljelmus Cæsius, anno 1622." The representation of Spitsbergen on them is copied from Daniel's map in 'Histoire du Pays nommé Spitsberg,' but the names are altered in one or two cases, and the coast-line is continued in a north-easterly direction. Edge's island is not marked, but its place is approximately occupied by "Marsyn," which, as I have shown, was the name mistakenly applied to it by Carolus (though he miswrote it Morfyn). Marsyn is, of course, a miswriting of Matsyn.

At lat. 82° N.W. of the north-west corner of Spitsbergen, there is written on the globes, 'Hollandi huc usque fuerunt a° 1614." This, therefore, is another record of what I have shown to be Carolus' false claim to have attained that latitude in the year in question.

The names in the 'Hist. du pays Sp.' map are English, those on the globes are Dutch, and are as follows, in order from north to south:—

S. Maria Magdalene sond	Groenhaven
Ghebrokeland	Koudeherberg
Schoonvoorland	Kloksond
Engelschebay (King's bay)	Belsond
Keerwyk	Schoonhaven
Behoudenhaven	Hoornbaye
Yssond	Suydhoeck

Vogelhoeck is marked at the north end of Kyn Eyl.

MARTIN CONWAY.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Austria—Bosnia and Herzegovina. **Nikashinovich.**

Bosnien und die Herzegovina unter der Verwaltung der österreichisch-ungarischen Monarchie und die österr.-ungar. Balkanpolitik. Eine politischökonomische Darstellung der gegenwärtigen Zustände in 4 Bänden. Verfasst von

Božidar Nikaschinovitsch. I. Band: Berliner Kongress 1878 und die Agrarfrage. Berlin: Thormann & Goetsch, 1901. Size 10 × 7, pp. viii. and 172.

This work, of which the first volume only has yet appeared, is intended to present a picture of the development of Bosnia and Herzegovina since their occupation by Austria in 1878.

Austria—Dalmatia. *B.S.G. Italiana* 2 (1901): 712–723. **Dainelli.**

Il Monte Promina in Dalmazia. Nota del socio dott. Giotto Dainelli.

Austria—Earthquakes. *Sitzb. A.W. Wien* 109 (*Abth. I.*) (1900): 151–314. **Mojsisovics.**

Mittheilungen der Erdbeben-Commission der Kaiserlichen Akademie der Wissenschaften in Wien. XVIII. Allgemeiner Bericht und Chronik der im Jahre 1899 innerhalb des Beobachtungsgebietes erfolgten Erdbeben, zusammengestellt von Dr. Edmund v. Mojsisovics. *With Maps.*

Austria-Hungary. **Schoeller.**

Trade of Austria-Hungary for the year 1900. Foreign Office, Annual No. 2664, 1901. Size $9\frac{1}{2} \times 6$, pp. 28. *Price 2d.*

Austria-Hungary—Census. *G.Z.* 7 (1901): 287–290. **Rebhann.**

Das Wachstum der Bevölkerung in Österreich-Ungarn. Von Prof. Dr. Andreas Rebhann.

Belgium. *B.S.R. Belge G.* 25 (1901): 149–176. **Rahir.**

Les curiosités de la commune de Furfooz. Par Edmond Rahir. *With Plan and Illustrations.*

Belgium. **Scudamore.**

Belgium and the Belgians. By Cyril Scudamore. Edinburgh and London: W. Blackwood & Sons, 1901. Size $8 \times 5\frac{1}{2}$, pp. xii. and 362. *Map and Illustrations. Price 6s. Presented by the Publishers.*

The object of this book is stated to be "not that of a guide-book, but rather to convey that information respecting Belgium and its people which we look for in vain in the excellent topographical works of Baedeker, Murray," etc. It contains useful chapters on religion, education, politics, the military system, etc., as well as that more purely descriptive.

Denmark—Census. *G.Z.* 7 (1901): 402–408. **Neukirch.**

Vorläufige Ergebnisse der allgemeinen dänischen Volkszählung vom 1 Februar, 1901 (eigentliches Dänemark). Von Dr. K. Neukirch.

English Channel. ——

Supplement, 1900, relating to the Channel Pilot. Part ii. Coast of France and the Channel Islands, 1897. (Corrected to September, 1900.) London: J. D. Potter, 1900. Size 10 × 6, pp. 80. *Price 6d. Presented by the Hydrographer, Admiralty.*

Europe—Geological History. *Globus* 79 (1901): 264–267. **Nehring.**

Fossile Kamele in Rumänien und die pleistocäne Steppenzeit Mitteleuropas. Von Prof. Dr. A. Nehring. *With Illustrations.*

Europe—Historical. *Rev. Historique* 76 (1901): 297–328. **Bourilly.**

L'ambassade de la Forest et de Marillac à Constantinople, 1535–1538. Par V. L. Bourrilly.

On an embassy sent by Francis I. of France to the Sultan with a view to securing a counterpoise to the power of the Emperor Charles V.

Faroe Islands. *Deutsche Rundschau G.* 23 (1901): 437–445. **Schoener.**

Die Faröer. Von G. Schoener. *With Map.*

Based upon a work lately published at Copenhagen.

France. *B.S.G. Marseille* 25 (1901): 7–19 **Clerc.**

Le bassin de Marseille, géographie et géologie. Par M. Michel Clerc.

France. *La G., B.S.G. Paris* 3 (1901): 449–460. **Lallemand.**

La réfection du Cadastre et la carte de France. Par Ch. Lallemand.

The writer describes the movement lately set on foot for the re-execution of the cadastral survey of France, and the experimental operations carried out under his direction in the commune of Neuilly-Plaisance near Paris.

Greece—Cyclades. **Cottrell.**

Trade of the Cyclades for the year 1900. Foreign Office, Annual No. 2599, 1901. Size 10 × 6, pp. 18. *Price* 1½*d.*

Iceland. *J. Manchester G.S.* **16** (1900): 229–243. **Newby.**

Iceland and the Icelanders. By J. R. Newby. III. *With Illustrations.*

Mediterranean—Cyprus. *Scottish G. Mag.* **17** (1901): 292–299. ——

Cyprus of To-day.

From an article by Dr. Maas in the *Geographische Zeitschrift.*

Norway—Christiania. **Amnéus.**

La ville de Kristiania, son Commerce, sa Navigation, et son Industrie. Résumé historique. . . . Par G. Amnéus. Kristiania, 1900. Size 9 × 6, pp. iv. and 180. *Illustrations.*

Norway—Lakes. **Huitfeldt-Kaas.**

Vidensk. Skrifter. I.—*Math.-naturv. Klasse* (1900), (No. 2): pp. 8.

Die limnetischen Peridineen in norwegischen Binnenseen. Von H. Huitfeldt-Kaas. *With Plate.*

Norway—Winds. **Mohn.**

Vidensk. Skrifter. I.—*Math.-naturv. Klasse* (1900), (No. 1): pp. 44.

Klima-Tabeller for Norge. XIII. Nedbør-Vindroser. Af H. Mohn.

Gives the results of twenty years' observations at seventy-seven stations in Norway.

Russia—Finland. **Mechelin and Others.**

Exposition Universelle de 1900. Notices sur la Finlande. Helsingfors, 1900. Size 9½ × 6. *Maps and Illustrations. Presented by J. Westlake, Esq.*

A collection of papers by various writers on the geography, government, social, intellectual, and material culture of Finland.

Russia—Survey. *M. Militär-G.I.* **20** (1900): 158–170. **Bielawski and Hartenthurn.**

Die topographischen Arbeiten im westrussischen Grenzgebiete. Von Josef Bielawski und Vincenz Haardt von Hartenthurn. *With Maps.*

Russia—Ural Mountains. *B. American G.S.* **33** (1901): 103–111. **Purington.**

Topographic Notes on the Ural Mountains. By Chester W. Purington. *With Sketch-maps.*

The writer lays stress on the great age of the Urals as a mountain range, and on the uniformity of conditions which have prevailed over a large area.

Servia. *B.S.G. Com. Bordeaux* **27** (1901): 153–159. **Delarue.**

La Serbie et les relations franco-serbes. Par Ch. Delarue.

United Kingdom—Birmingham Waterworks. **Webber.**

How the Welsh Water will come to Birmingham. By W. H. Y. Webber. (From the *Pall Mall Magazine*, June, 1901, pp. 181–191.) Size 9½ × 6½. *Illustrations.*

United Kingdom—Census. *J.R. Statistical S.* **64** (1901): 307–314. ——

First Results of the Census, 1901.

United Kingdom—Coal. **Geikie.**

How long will our Coal last? By James Geikie, F.R.S. (From the *Pall Mall Magazine*, July, 1901, pp. 390–398.)

Prof. Geikie dissents from the opinion of Prof. Hull that the question of the duration of our coal-supply is to this generation a matter only of academical interest.

United Kingdom—England and Wales—Census. ——

Census of England and Wales, 1901. Preliminary Report, and Tables of the Population and Houses enumerated in England and Wales, and in the Islands in the British Seas, on April 1, 1901. London: Eyre & Spottiswoode, 1901. Size 13 × 8½, pp. xx. and 158. *Price* 1*s.* 5½*d.*

United Kingdom—Fisheries. *Quarterly Rev.* **194** (1901): 83–102. ——

The Decay of our Sea Fisheries.

United Kingdom—Ireland—Census. ——

Census of Ireland for the year 1901. Preliminary Report, with Abstract of the Enumerators' Summaries. Dublin: E. Ponsonby, 1901. Size 13 × 8½, pp. 22. *Price* 2½*d.*

2 O 2

United Kingdom—Ordnance Survey. ———
Catalogue of the Maps and Plans and other Publications of the Ordnance Survey of England and Wales and the Isle of Man to January 1, 1901. London, 1901. Size 9½ × 6, pp. 810. *Index-maps. Price 1s. 6d.*

United Kingdom—Surrey. **Jerrold.**
Surrey. By Walter Jerrold. With special articles on the Bird-Life, Flowers, Entomology, Geology, Cycling, etc., of the County. London: J. M. Dent & Co., 1901. Size 7 × 4½, pp. xiv. and 316. *Maps and Illustrations. Price 4s. 6d. net. Presented by the Publishers.*

A tastefully got up guide to the scenery and other attractions of Surrey, which should prove useful to the increasing number of Londoners and others who seek their recreation within its borders.

United Kingdom—Yorkshire. *J. Manchester G.S.* **16** (1900): 244–257. **Gleave.**
The Yorkshire Dales: Wharfedale (Rievaulx Abbey) and Ryedale. By J. J. Gleave. *With Illustrations.*

ASIA.

Asia. *National G. Mag.* **12** (1901): 281–290. **McGee.**
Asia, the Cradle of Humanity. By WJ McGee.

Asia—Exploration. *La G., B.S.G. Paris* **4** (1901): 21–28. **Deniker.**
Récentes explorations russes en Asie. Par J. Deniker.

Asia—Exploration. *Deutsche Rundschau G.* **23** (1901): 446–463. **Jüttner.**
Fortschritte der geographischen Forschungen und Reisen im Jahre 1900. I. Asien. Von Dr. J. M. Jüttner.

Central Asia. *B. Comité l'Asie Française* 1 (1901): 99–105. **Saint-Yves.**
L'état actuel des rapports anglo-russes dans l'Asie centrale. Par G. Saint Yves. *With Maps.*

Ceylon—Veddahs. **Hiller and Furness.**
B. Free Museum Sci. and Art, University Pennsylvania **3** (1901): 69–87.
Notes of a Trip to the Veddahs of Ceylon. By Dr. H. M. Hiller and Dr. W. H. Furness. *With Illustrations.*

China. **Cordier.**
Histoire des Relations de la Chine avec les Puissances Occidentales 1860–1900. L'Empereur T'Oung Tché (1861–1875). Par Henri Cordier. Paris: F. Alcan. 1901. Size 9 × 6, pp. 570.

This accurate account of the relations between China and the European Powers during the past thirty years is likely to prove of much value at the present time.

China. *J. Franklin I.* **152** (1901): 141–152. **Garrison.**
Some Effects of Deforestation in China. By F. Lynwood Garrison. *With Map.*

The writer is one of those who still hold to the belief in the effect of deforestation on rainfall. "If any," he says, "doubts that drought, flood, and famine follow deforestation as surely as night succeeds day, let him visit China. . . ."

China. *B.S.G. Marseille* **25** (1901): 20–40. **Monod.**
En Chine. Par M. H. G. Monod.

Account of a journey in Yunnan, Kweichau, and part of Sechuan.

China—Minerals. *B.S.G. de l'Est* **21** (1901): 543–550. **Leclère.**
Les ressources minérales des provinces chinoises voisines du Tonkin. Par A. Leclère.

China—Newchwang. **Fulford.**
Trade of Newchwang for the year 1900. Foreign Office, Annual No. 2646, 1901. Size 9½ × 6, pp. 8. *Price ½d.*

China—Yang-tse-Kiang. *Globus* **80** (1901): 55–60. ———
Der Yang-tse-kiang, die deutschen Interessen und die Bedeutung des Stromes für die Erschliessung Chinas. *With Illustrations.*

China—Yunnan. *B. Comité l'Asie Française* 1 (1901): 141–158. ———
Le chemin de fer du Yunnan. Par R. C. *With Map.*

The project for a railway from Tong-king to the capital of Yunnan was ratified by the French chambers in June and July last.

Chinese Empire—Tangut. **Parker.**
Imp. and Asiatic Quarterly Rev. **11** (1901): 363-378; **12** (1901): 156-179.

Marco Polo's Tangut. By C. H. Parker.

Chinese Turkestan. **Stein.**
Archæological Discoveries in the neighbourhood of the Niya River. By M. A. Stein. (From the *Journal of the Royal Asiatic Society*, July, 1901.) Hertford: 1901. Size 8½ × 5½, pp. 4. *Presented by the Author.*

Over an area once irrigated from the Niya river the author found ruins of old dwelling-houses, Buddhist monasteries, etc., which yielded an abundant supply of epigraphical and other relics.

Dutch East Indies. **Meyjes.**
Tijds. K. Ned. Aard. Genoots. Amsterdam **18** (1901): 543-583.

De Astronomische Plaatsbepalingen ten dienste der Hydrographie in Ned. Indië (1857-'94). Door R. Posthumus Meyjes. *With Maps.*

A sketch of the various operations for the astronomical determination of position in the Dutch East Indies, chiefly since 1890.

India and Ceylon—Tea. *Die Natur* **50** (1901): 253-256. **Schulte.**
Die Kultur von Thee in Britisch-Indien und Ceylon. Nach Dr. A. Schulte.

Indian Ocean—Christmas Island. **Clayton.**
Christmas Island. Report for 1900. Colonial Reports, Annual No. 319, 1901. Size 9¾ × 6, pp. 20. *Price 1½d.*

Indian Ocean—Maldive Islands. **Gardiner.**
The Natives of the Maldives. By J. Stanley Gardiner. [Extracted from the *Proceedings of the Cambridge Philosophical Society*, vol. xi. pt. i.] Size 9 × 6, pp. 17-20.

Indian Ocean—Minikoi. **Gardiner.**
The Atoll of Minikoi. By J. Stanley Gardiner. [Extracted from the *Proceedings of the Cambridge Philosophical Society*, vol. xi. pt. i.] Size 9 × 6, pp. 22-26. *Map.*

A note on these two papers appeared in the *Journal* for May (p. 526).

Indian Ocean—Seychelles. *B.G. Hist. et Descriptive* (1900): 268-273. **Saint-Yves**
Les îles Seychelles en 1791. Par M. G. Saint-Yves.

Malay Archipelago—Java. **Oudemans.**
Die Triangulation von Java ausgeführt vom Personal des geographischen Dienstes in Niederländisch Ost-Indien. Sechste und letzte Abtheilung. Die Höhen-, Breiten- und Azimuthbestimmungen, die Lothabweichungen im Sinne des Meridians und des Parallels, nebst einem Anhange: Geschichtliches über die terrestrische Refraction, im Auftrag des Ministeriums von Kolonien und unter Mitwirkung von M. L. J. van Asperen bearbeitet von Dr. J. A. C. Oudemans. Haag, M. Nijhoff, 1900. Size 14 × 10½, pp. iv., 154, and 88. *Maps and Diagrams. Presented by the Editor.*

Persia. *J.R. Statistical S.* **64** (1901): 265-291. **Rabino.**
An Economist's Notes on Persia. By Joseph Rabino.

Philippine Islands. *B. American G.S.* **33** (1901): 112-123. **Becker.**
Conditions requisite to our Success in the Philippine Islands. By G. F. Becker.

Russia—Kirghiz Steppe. *Petermanns M.* **47** (1901): 106-114. **Stahl.**
Beobachtungen in den Kirgisensteppen. Von A. F. Stahl. *With Map.*

Russia—Tiflis Observations. ———
Beobachtungen des Tifliser Physikalischen Observatoriums im Jahre 1897. Tiflis, 1900. Size 12½ × 9¼, pp. lvi. and 198.

Tibet. *Miss. Catholiques* **33** (1901): 259-264, 269-273, 279-281, 292-295. **Monbeig.**
Voyage en Pays Thibétains. Par M. Th. Monbeig. *With Illustrations.*

On a journey through the Tibetan districts on the western borders of China.

Turkey. *Z. Ges. Erdk. Berlin* **36** (1901): 69-99. **Oppenheim.**
Bericht über eine im Jahr 1899 ausgeführte Forschungsreise in der Asiatischen Türkëi. Von Dr. Max Frhr. v. Oppenheim. *With Map and Plates. Also separate copy, presented by the Author.*

Turkey. *Verh. Ges. Erdk. Berlin* 28 (1901): 294–295. **Rohrbach.**
Vergangene und zukünftige Kultur am Euphrat und Tigris. Studien in Mesopotamien und Babylonien im Winter 1900–1901. Von Dr. Paul Rohrbach.

Turkey—Asia Minor. *Z. Ges. Erdk. Berlin* 36 (1901): 100–114. **Brennecke.**
Ergebnisse der Höhenmessungen Prof. A. Philippson's in der Umgebung von Pergamon. Von W. Brennecke.

Gives the results of altitude-determinations by aneroid during a journey in September and October of last year.

Turkey—Asia Minor. *Petermanns M.* 47 (1901): 132–137. **Schaffer.**
Zur Geotektonik des südöstlichen Anatolien. Studien auf Reisen im Frühjahr und Herbst 1900. Von Dr. Franz Schaffer. *With Map.*

This is noticed elsewhere (*ante*, p. 440).

Western Asia. *Scottish G. Mag.* 17 (1901): 281–292. **Medley.**
India to England *viâ* Central Asia and Siberia. By Major E. J. Medley.

The journey was undertaken from Gilgit in October of last year, and led *viâ* Kashgar and Vernye to Semipalatinsk.

AFRICA.

Africa. *La G., B.S.G. Paris* 4 (1901): 97–103. ——
Récentes explorations françaises en Afrique. 1° Exploration de M. de Mathuisieulx en Tripolitane. 2° Lettre de M. Fondère sur l'exploration de la Bali, par MM. Frédon et Cadenat. 3° Nouvelle exploration de M. G. Grandidier à Madagascar. 4° La Mission Lesieur au Congo français.

The second and fourth of these papers are referred to at p. 535, *ante*.

Basutoland. *Scottish G. Mag.* 17 (1901): 347–362. **Lagden.**
Basutoland and the Basutos. By Sir Godfrey Lagden, K.C.M.G.

British Central Africa. *Scottish G. Mag.* 17 (1901): 363–377. **Capenny.**
Railway Schemes in Relation to British Central Africa. By S. H. F. Capenny.

British East Africa. **Hinde.**
The Last of the Masai. By Sidney Langford Hinde and Hildegarde Hinde. London: William Heinemann, 1901. Size 10 × 7½, pp. 200. *Illustrations. Presented by the Authors.*

This will receive special notice.

British East Africa—Uganda Railway. **[Gracey.]**
Africa. No. 6 (1901). Correspondence respecting the Uganda Railway. London: Eyre & Spottiswoode, 1901. Size 13 × 8½, pp. 68. *Price 7d.*

See note in September *Journal* (p. 310).

British South Africa. ——
The British South Africa Company. Reports on the Administration of Rhodesia, 1898–1900. Size 10½ × 8½. *Maps. Presented by the British South Africa Co.*

This is noticed in the Monthly Record (p. 533).

British South Africa—Matabeleland. *J. Anthrop. I.* 31 (1901): 21–28. **White.**
On the Ruins of Dhlo-Dhlo, in Rhodesia. By Franklin White. *With Plates.*

These ruins, which lie some 50 miles north-east of Bulawayo, were first examined by Dr. H. Schlichter, who spoke of them as the "Mombo" ruins, from the name of the district. Mr. White has lately made a plan of the chief of them, and taken photographs showing the mode of construction and ornamentation of the walls.

Central Africa. *B.S.G. Marseille* 25 (1901): 47–53. **Roulet.**
Mission du Congo au Nil, conférence du Commandant Roulet.

The author commanded an expedition for the support of Marchand in 1897.

Congo State. *Imp. and Asiatic Quarterly Rev.* 12 (1901): 86–100. **Bourne.**
The Congo Free State. By H. R. Fox Bourne.

Congo State. *Mouvement G.* 18 (1901): 382–385. **Thonnar.**
Les populations errantes de l'État du Congo. Par Albert Thonnar.

An extract from a larger work lately published at Brussels.

East Africa—Pemba. **O'Sullivan-Beare.**
Report on the Island of Pemba for the year 1900. Foreign Office, Annual No. 2653, 1901. Size 9½ × 6, pp. 26. *Plate. Price* 3½*d.*

The year 1900 was unfavourable owing to the scantiness of the clove-crop and the low prices ruling. Statistics are given as to the manumission of slaves, the greater number of whom have settled on "shambas" upon conditions entered into with the Arab cultivators.

Egypt. **Rumbold.**
British Trade with Egypt during the years 1895–1900. Foreign Office, Miscellaneous, No. 557, 1901. Size 9½ × 6, pp. 32. *Price* 2*d.*

Eritrea. *B.S.G. Italiana* **2** (1901): 750–753. ——
La Sfera d'influenza italiana in Africa nella 'Spezial Karte von Afrika' di Hermann Habenicht. *Map.*

The map shows the frontiers of Eritrea as fixed by the latest agreements.

Fernando Po. *Kolon. Z.* **2** (1901): 191–194. ——
Fernando Poo.

A summary of our present knowledge of the island.

Madagascar. *Rev. G.* **49** (1901): 83–85. ——
Une reconnaissance au plateau de l'Androy, et au Faux-Cap au sud-est de Madagascar (juin-juillet 1900). Par S. L. *With Maps.*

Madagascar—Betsileo. *Antananarivo Annual* **6** (1900): 481–485. **Johnson.**
Betsileo, Past and Present. A Twenty Years' Review. By H. T. Johnson.

Madagascar—Imerina. *Antananarivo Annual* **6** (1900): 451–475. **Lord.**
The Early History of Imerina based upon a Native Account. By T. Lord.

Madagascar—Sakalava. *Antananarivo Annual* **6** (1900): 408–437. ——
Observations on the Sakalava.

Nigeria. *Monthly Rev.* **3** (1901): 67–78. **Bindloss.**
Nigeria and its Trade. By Harold Bindloss.

North-East Africa. **Crosby**
Notes on a Journey from Zeila to Khartum. By Oscar T. Crosby. (From the *Geographical Journal* for July, 1901.) Size 10 × 6½, pp. 16. *Map and Illustrations.*

North-East Africa. **Sacchi, d'Ossat, and Millosevich.**
Seconda Spedizione Bòttego. Studio geologico sul materiale raccolto da M. Sacchi. G. de Angelis d'Ossat e F. Millosevich. Roma, 1900. Size 10 × 7, pp. x. and 212. *Map and Plates. Price* 5*s. net.*

A valuable contribution to our knowledge of the geology of Central Africa, supplementing the results previously published in the work of Lieuts. Vannutelli and Citerni.

North-West Africa. *Rev. G.* **48** (1901): 451–462; **49** (1901): 1–12. **Cuny.**
La conquête du Touat et le Maroc. Par Général L. Cuny. *With Illustrations.*

Upper Nile. *Quarterly Rev.* **194** (1901): 1–32. ——
Negro Nileland and Uganda. *With Map.*

A summary of recent work on the upper Nile.

NORTH AMERICA.

Alaska—Altitudes. *B. United States Geol. Surv.* No. 169 (1900): pp. 14. **Gannett.**
Altitudes in Alaska. Compiled by Henry Gannett.

The height of Mount McKinley is given as 20,464 feet, as determined by Mr. Muldrow (see below).

Alaska—Mount McKinley. *National G. Mag.* **12** (1901): 312-313. **Muldrow.**
Mount McKinley. By Robert Muldrow. *With Map.*

See note in the present number of the *Journal* (p. 536).

Bermuda. **Smith.**
Bermuda. Report for 1900. Colonial Reports, Annual, No. 322, 1901. Size 9½ × 6, pp. 20. *Price* 1½*d.*

Canada—British Columbia. ——

Annual Report of the Minister of Mines for the year ending 31st December, 1900. Being an account of Mining Operations for Gold, Coal, etc., in the Province of British Columbia. Victoria, B.C., 1901. Size 10 × 7, pp. 703–1027. *Maps and Illustrations.*

This report records a rapid growth within recent years of the mining industry of British Columbia. A general map shows the mining districts of the province, the northern portion of which is shown separately on the large scale of 6 miles to the inch.

Canada—Nova Scotia. Daly.

The Physiography of Acadia. By Reginald A. Daly. Bulletin Museum Comparative Zoology at Harvard College, vol. xxxviii. Geological Series, vol. v. No. 3. Cambridge, Mass., 1901. Size 9½ × 6, pp. 73–104. *Map and Plates. Presented by the Author.*

North America—Bibliography. Weeks.

B. United States Geol. Surv. No. 172 (1900): pp. 142.

Bibliography and Index of North American Geology, Paleontology, Petrology, and Mineralogy for the year 1899. By Fred Boughton Weeks

North America—Historical. Chesnel.

Histoire de Cavelier de La Salle. Exploration et Conquête du Bassin du Mississipi. D'Après les Lettres de La Salle, les Relations présentées à Louis xiv. en son nom, les Relations de plusieurs de ses compagnons de voyage, les Actes officiels et autres Documents contemporains. Par P. Chesnel. Paris: J. Maisonneuve, 1901. Size 9½ × 5½, pp. 228.

Although the explorations of La Salle have been dealt with by Margry in his great collection of original documents, this seems to be the first full and yet popular account of the exploits of the great French explorer which has appeared in his own country. It may be placed on a level with Parkman's well-known work on the same subject.

United States. *B. United States Geol. Surv.* No. 174 (1900): pp. 78. Baker.

Survey of the North-Western Boundary of the United States, 1857–1861. By Marcus Baker. *With Index Map.*

A historical sketch of the establishment and survey of the boundary between the United States and Canada along the forty-ninth parallel.

United States. *B. United States Geol. Surv.* No. 171 (1900): pp. 142. Gannett.

Boundaries of the United States and of the Several States and Territories, with an outline of the History of all important changes of territory. (Second Edition.) By Henry Gannett. *With Maps and Diagrams.*

A revised edition, brought up to date, of a previous bulletin, published in 1885.

United States—Indiana—Caves. Farrington.

Observations on Indiana Caves. By Oliver Cummings Farrington, PH.D. (Field Columbian Museum. Publication 53. Geological Series. Vol. i. No. 8.) Chicago, 1901. Size 10 × 6½, pp. 247–266. *Illustrations. Presented by the Field Columbian Museum.*

United States—Iroquois. *Rev. G.* 49 (1901): 58–70. Tricoche.

Les derniers des Iroquois. Par George Nestler Tricoche. *With Map.*

United States—Kentucky. *J. School G.* 4 (1900): 361–370. Temple.

Louisville: a Study in Economic Geography. By Ellen C. Temple.

An instructive study of the working of geographical forces in a city typical of a large percentage of the cities of the United States.

United States—Maryland. Shattuck.

Johns Hopkins University Circulars 20 (1901): 69–75.

The Pleistocene Problem of the North Atlantic Coastal Plain. By George Burbank Shattuck.

On the recent geological history of the coast region of Maryland.

United States—Maryland. ——

Maryland Geological Survey. Eocene. Baltimore, 1901. Size 10½ × 7, pp. 332. *Map and Plates. Presented by the State Geologist, Maryland.*

This is the first volume of a contemplated series of reports dealing with the systematic geology and palæontology of Maryland.

United States—Meteorology. ———

U.S. Department of Agriculture. Weather Bureau. Report of the Chief of the Weather Bureau. 1898–99. 2 vols. Washington, 1900. Size 12 × 9, pp. (vol. i.) 248; (vol. ii.) 788. *Diagrams. Presented by the U.S. Department of Agriculture, Weather Bureau.*

United States—Montana. *American J. Sci.* **12** (1901): 1–17. **Weed and Pirsson.**

Geology of the Shonkin Sag and Palisade Butte Laccoliths in the Highwood Mountains of Montana. By W. H. Weed and L. V. Pirsson. *With Illustrations.*

United States—Observations. ———

Astronomical, Magnetic, and Meteorological Observations made during the years 1891 and 1892, at the United States Naval Observatory. Washington, 1899. Size 12 × 9, pp. lx. 56, 58; xxxii. 24, 64; lxii. and 288.

United States—Trade. **Hitchcock.**

Our Foreign Trade in Agricultural Products, 1891–1900. By Frank H. Hitchcock. (U.S. Department of Agriculture. Section of Foreign Markets. Bulletin No. 23.) Washington, 1900. Size 9½ × 6, pp. 62.

United States—Trade. *Fortnightly Rev.* **70** (1901): 61–75. **Taylor.**

Maritime Expansion of America. By Benjamin Taylor.

United States—Zinc Industry. **Erskine.**

Zinc Industry in the United States. Foreign Office, Miscellaneous, No. 550, 1901. Size 9½ × 6, pp. 8. *Price ½d.*

CENTRAL AND SOUTH AMERICA.

Antigua. *Monthly Weather Rev.* **29** (1901): 165–167. **Alexander.**

The climatology of Antigua, W.I. By Wm. H. Alexander.

Antigua. *Monthly Weather Rev.* **29** (1901): 168–173. **Kimball.**

The seasonal variations in the climate of Antigua, W.I. By H. H. Kimball.

Argentine Republic. **Betbeder.**

Memoria del Ministerio de Marina correspondiente al ejercicio 1900–1901. Presentada al Honorable Congreso de la Nacion por el Ministro de Marina, Capitán de Navío Onofre Betbeder. Buenos Aires, 1901. Size 10½ × 7, pp. 52.

Argentine Republic. *B.S.G. Italiana* **2** (1901): 723–744, 798–814. **Cipolletti.**

Repubblica Argentina; Territori del Rio Negro e del Rio Colorado; descrizione, studi idrologici e proposte di colonizzazione, del socio ing. Cesare Cipolletti.

Argentine Republic. **Martinez.**

Manual del Viajero. Baedeker de la República Argentina. Por Alberto B. Martínez. Buenos Aires, 1900. Size 6½ × 4½, pp. xiv. and 370. *Map, Plans, and Illustrations.*

This guide to the Argentine Republic is produced on the model of Baedeker's guides. It contains an introduction giving a general summary of the history, geography, industries, etc., of the country; an account of the city of Buenos Aires, its public institutions, etc.; and a detailed account of the principal routes from the capital to the outer borders of the republic. The arrangement shows here and there some confusion, which will no doubt be rectified in a new edition.

Bolivia. ———

Anexos a la Memoria del Ministro de relaciones exteriores y Culto presentada al Congreso ordinario de 1900. La Paz, 1901. Size 11½ × 7½, pp. 342.

A collection of documents bearing on the relations of Bolivia with other States.

Brazil. **Rhind.**

Financial and Economic Situation in Brazil. Foreign Office, Miscellaneous, No. 558, 1901. Size 9½ × 6, pp. 10. *Price 1d.*

Chile. **Fagalde.**

Magallanes el pais del porvenir. Por Alberto Fagalde. Tomo Primero. Valparaiso, 1901. Size 10½ × 7, pp. vi. and 438. *Map, Plan, and Illustrations.*

The first part of this work gives a useful summary of the history of discovery in Southern Patagonia; the second an account of the recent development of the country, of the capabilities of which the author holds sanguine views.

Chile—Hydrography. ———

Anuario hidrografico de la Marina de Chile. Tomo 22. Valparaiso, 1900. Size $10\frac{1}{2} \times 7$, pp. 38 and 516. *Charts and Diagrams. Presented by the Chilean Admiralty.*

Contains several papers on recent surveys of the Chilian coasts.

Cuba. *American J. Sci.* 12 (1901): 33–41. **Peckham.**

Bituminous Deposits situated at the South and East of Cárdenas, Cuba. By H. E. Peckham. *With Sketch-maps.*

Haiti. *Petermanns M.* 47 (1901): 121–127. **Gentil-Tippenhauer.**

Beiträge zur Geologie Haïtis. Von L. Gentil-Tippenhauer. IV. Die Erzfundstätten von Terre-Neuve und Gonaives. *With Map.*

South America. *M.V. Erdk. Leipzig* (1900): 27–115. **Arldt.**

Ueber den Parallelismus der Küsten von Südamerika. Von Dr. Theodor Arldt. *Map.*

A note on this paper appears in the Monthly Record.

AUSTRALASIA AND PACIFIC ISLANDS.

Australasia. **Grey.**

Australasia Old and New. By J. Grattan Grey. London: Hodder & Stoughton, 1901. Size $8 \times 5\frac{1}{2}$, pp. xvi. and 396. *Portrait. Price 7s. 6d. Presented by the Publishers.*

The author has written this book with a view to combating the ignorance on Australasian affairs, which he considers to prevail in this country on the part of the general public. In it he traces the history of the colonies from their first beginnings down to the opening of the present century, and endeavours to present a clear picture of their present condition and prospects. His views, which are expressed without reserve, will doubtless not meet with approval in some quarters, but the book should be of use in directing attention to the many important problems awaiting solution in the new commonwealth and adjacent countries.

Australia and Pacific. *B. Comité l'Asie Française* 1 (1901): 134–141. **Leroy-Beaulieu.**

L'Australie et le Pacifique: Les forces, les faiblesses et les prétentions de la fédération australienne. Par Pierre Leroy-Beaulieu.

Australia and Pacific. **Schanz.**

Australien und die Südsee an der Jahrhundertwende. Kolonialstudien von Moritz Schanz. Berlin: W. Süsserott, 1901. (London: Williams & Norgate.) Size $10 \times 6\frac{1}{2}$, pp. 326. *Illustrations. Presented by the Publisher.*

The author places before the German public a clear account of the Australasian colonies, their history, resources, present condition, scenery, etc., with chapters on Fiji, Tonga, and Samoa. The work will be useful, outside Germany, as a compendium of information on the countries dealt with, the collection of which might otherwise be a work of some trouble. It is excellently illustrated with views of scenery, etc.

Australia and Tasmania—Ornithology. **North.**

Australian Museum, Sydney. Special Catalogue No. 1. Nests and Eggs of Birds found breeding in Australia and Tasmania. By Alfred J. North. Second Edition of Catalogue No. xii., entirely re-written, with additions. Part i. Sydney, 1901. Size $12\frac{1}{2} \times 10$, pp. 36. *Illustrations. Presented by the Australian Museum, Sydney.*

The first instalment of an important work on Australian Ornithology. It is produced in excellent style, and is not by any means a mere catalogue, but contains much information as to the birds and their habits, as well as their nests and eggs.

POLAR REGIONS.

Antarctic. **Bernacchi.**

To the South Polar Regions. Expedition of 1898–1900. By Louis Bernacchi. London: Hurst & Blackett, 1901. Size 9×6, pp. xvi. and 348. *Charts and Illustrations. Price 12s. net. Presented by the Publishers.*

This will be specially noticed.

Antarctic. *B.S.G. Italiana* 2 (1901): 653–658. **Faustini.**

La "Groenlandia del Sud." Nota del socio A. Faustini.

Discusses the question of the "New South Greenland" reported by the American whaling captains Johnson and Morell. The writer thinks it quite possible that a

higher latitude was reached by these than by their successors in the region in question (48° 10′ W.).

Antarctic—Belgian Expedition. **Gribaudi**
Riv. G. Italiana **8** (1901): 345–355, 449–460.

Il primo sverno nelle regioni polari antartiche. Alcuni risultati scientifici della spedizione antartica belga (A. De Gerlache) 1897–1899. Nota del Prof. Pietro Gribaudi.

Arctic—Auroras. *Monthly Weather Rev.* **29** (1901): 107–115. **Baldwin.**

Auroral observations on the Second Wellmann Expedition made in the neighbourhood of Franz Josef Land. By E. B. Baldwin. *Also separate copy, presented by the Author.*

Arctic—Jan Mayen. *Bihang Svensk. A. Handlingar* **26** (1900), (No. 13): 16. **Dusén.**

Beiträge zur Flora der insel Jan Mayen. Von P. Dusén. *With Plate.*

Greenland. **Nathorst.**

Bidrag till nordöstra Grönlands geologi. Af A. G. Nathorst. (*Geol. Fören. Förhandl.*, No. 207, Bd. 23, Häft 4.) Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 275–306. *Map and Plates. Presented by the Author.*

Greenland. *P.A. Nat. Sci. Philadelphia* **53** (1901): 144–168. **Ortmann.**

Crustacea and Pycnogonida collected during the Princeton Expedition to North Greenland. By Dr. A. E. Ortmann.

Greenland. *P.A. Nat. Sci. Philadelphia* **53** (1901): 169–181. **Rankin.**

Echinoderms collected off the West Coast of Greenland by the Princeton Arctic Expedition of 1899. By Walter M. Rankin.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Denudation. *Naturw. Wochenschrift* **16** (1901): 369–373. **Passarge.**

Ueber Winderosion. Von Dr. S. Passarge. *With Illustrations.*

Geomorphology. *Ann. G.* **10** (1901): 289–294. **Martonne.**

Fjords, cirques, vallées alpines et lacs subalpins. Par M. Emm. de Martonne.

Gravity. *Sitzb. A.W. Wien* **108** (Abth. IIa.) (1899): 697–766. **Sterneck.**

Untersuchungen über den Zusammenhang der Schwere unter der Erdoberfläche mit der Temperatur. Von Oberst Robert v. Sterneck.

Meteorology. *Q.J. Geolog. S.* **57** (1901): 405–478. **Harmer.**

The Influence of the Winds upon Climate during the Pleistocene Epoch: a Palæometeorological Explanation of some Geological Problems. By F. W. Harmer. *With Charts.*

Mr. Harmer's suggestions were first brought forward at the Bradford meeting of the British Association (cf. *Journal*, vol. xvi. p. 446).

Oceanography. **Monaco.**

Notes de Géographie Biologique Marine. Communication faite au VIIème Congrès International de Géographie à Berlin en 1899. Par S. A. S. Albert I., Prince de Monaco. (Sonderabdruck aus den Verhandlungen des VII. Internationalen Geographen-Kongresses in Berlin, 1899.) Berlin, 1900. Size $10 \times 6\frac{1}{2}$, pp. 312–322.

Oceanography—Baltic. *Ann. Hydrographie* **29** (1901): 226–231. **Knudsen.**

Der baltische Strom und der Salzgehalt im Kattegat und im westlichen Theile der Ostsee. Von Martin Knudsen.

Oceanography—Fauna. **Monaco.**

Résultats des Campagnes scientifiques accomplies sur son yacht par Albert Ier Prince Souverain de Monaco publiés sous sa direction avec le concours de M. Jules Richard. Fasc. xvii. Céphalopodes provenant des campagnes de la *Princesse-Alice* (1891–1897). Par Louis Joubin (pp. 136). Fasc. xviii. Hydraires provenant des campagnes de *l'Hirondelle* (1886–1888). Par Camille Pictet et Maurice Bedot (pp. 58). Imprimerie de Monaco, 1900. Size 14×11. *Plates. Presented by H.S.H. the Prince of Monaco.*

Oceanography—Methods. *B.S.G. Com. Bordeaux* **27** (1901): 173–178. **Thoulet.**

Sur le mode de récolte des échantillons du sol sous-marin. Par J. Thoulet.

Volcanoes. *M.V. Erdk. Leipzig* (1900): 1–26. **Wägler.**
Die Geographische Verbreitung der Vulkane. Bemerkungen zu den Karten über die geographische Verbreitung des Vulcanismus. Von Dr. C. W. Wägler. *Maps.*

A note on this paper appears elsewhere (p. 510).

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Colonisation. *Rev. G.* **48** (1901): 241–253, 433–450; **49** (1901): 97–123. **Brugière.**
L'expansion européenne pendant le XIX^e siècle. Par F. Brugière.

Colonisation. *Kolon. Z.* **2** (1901): 223–225. **Meinecke.**
Kolonisatorische Aufgaben. I. Hebung der Produktion der Eingeborenen. Von G. Meinecke.

Commercial Geography. *Nautical Mag.* **70** (1901): 442–449. **Turner.**
The World's Great Ports. By W. Turner.

The writer calls attention to the enormous strides made within recent years by the port of Hamburg, which in 1900 for the first time stood first of all the ports of the world in the over-sea trade.

Commercial Geography—Coffee. *La G., B.S.G. Paris* **3** (1901): 471–488. **Lecomte.**
La Culture du café dans le monde. Par H. Lecomte. *With Maps.*

Man and the Ocean. *G.Z.* **7** (1901): 241–250. **Kirchhoff.**
Das Meer im Leben der Völker. Vortrag, gehalten am Institut für Meereskunde zu Berlin. Von Alfred Kirchhoff.

Mountain Passes. *B. American G.S.* **33** (1901): 124–137, 191–203. **Semple.**
Mountain Passes. A Study in Anthropogeography. By Ellen C. Semple.

See note in *Journal* for September (p. 316).

National development. *Rev. G. Italiana* **8** (1901): 432–448. **Biasutti.**
La Base economica delle conquiste geografiche. Nota di Renato Biasutti.

On the influence of economic factors on the expansion of peoples.

GENERAL.

Bibliography. **Raveneau.**
Dixième Bibliographie Géographique Annuelle, 1900, publiée sous la direction de Louis Raveneau. Annales de Géographie, No. 53, 10^e Année, 15 Septembre 1901. Paris: Armand Colin. Size 10 × 6½, pp. 320.

This latest volume of the useful geographical bibliography contains the titles of 908 works or papers, most of which are analyzed at greater or less length.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**
ORDNANCE SURVEY OF ENGLAND AND WALES: Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from September 1 to 31, 1901.

1-inch:—

With hills in brown or black: 131, 137, 148, 169, 193, 195, 211, 229 (engraved), 1*s.* *each*. Printed in colours: 10, 20, 23, 175, 181, 182, 184, 188, 1*s.* *each*. Pembroke, 228, 245 (combined), 1*s.* 6*d.*
Towns and country around, with roads printed in colour: Wolverhampton, 1*s.* 3*d.*

6-inch—County Maps:—

Bedfordshire, 26 S.W., 27 S.W., 30 N.E., 33 S.W., 34 N.E., 35 N.W., N.E. **Cumberland,** 23 N.E., 31 N.W. **Derbyshire,** 45 S.W., 47 N.W., N.E., S.W., 48 S.W., 49 S.E., 57 S.E. **Glamorganshire,** 13 N.W., 43 S.E., 47 N.W. **Merionethshire,** 1 S.W., S.E., 6 N.W., N.E.,

7 N.W., N.E., 8 N.W., N.E., S.W., S.E., 11 S.E., 12 S.W., S.E., 13 N.E., 14 N.W., 15 S.E., 16 N.E., 18 S.E., 19 S.E., 20 N.E., S.E., 21 N.W., S.W. **Monmouthshire**, 17 N.W., 37 S.E., **Northamptonshire** (1 N.E. and 2 N.W.). **Staffordshire**, 22 S.E., 23 N.W., N.E., S.E., 24, N.E., S.E., 25 N.W., S.E., 26 N.W., N.E., S.W., 31 S.W., 32 S.E. **Wiltshire**, 32 S.W., 38 S.E., 44 S.E., 45 S.W., 54 S.E., 57 N.E., S.E., 58 N.W., S.W., 69 S.E., 70 S.E. **1s.** *each.*

25-inch—County Maps:—

Cardiganshire, II. 3, 7. **Derbyshire**, LVII. 1; LIX. 3, 7, 8, 10, 11, 12, 15, 16; LX. 3, 8, 11, 13, 14, 15; LXI. 2, 5; LXII. 4, 8; LXIII. 1, 2, 3, 9. **Dorsetshire**, I. 10, 14, 15; II. 9; III. 4; IV. 2, 6, 15; VIII. 2, 4, 7, 8, 11, 12, 15, 16; IX. 4 (6 and 10), 7, 8, 9 (10 and 6), 11, 12, 13, 14, 15, 16; X. 1, 5, 6, 9, 10, 13; XIV. 3, 4; XV. 1, 2, 3, 4, 5, 6, 7, 8, 9; XVI. 1, 2, 5; LI. (2 and 3). **Huntingdonshire**, I. 12, 16; IV. 4; V. 1, 2, 8; VI. 9, 13, 14; IX. 7; X. 1, 5, 6, 7, 10, 13, 14; XIII. 4, 8, 16; XIV. 1, 2, 3, 5, 9, 10, 11, 13; XVII. 8, 12, 16; XVIII. 1, 3, 5, 6, 7, 10; XX. (2 and 1), 4, 6, 7, 8, 10, 11, 12; XXI. 1, 2, 7, 10, 11, 13, 16; XXII. 3, 5, 6, 7, 8, 9; XXV. 1, 2, 3, 4, 5, 7, 8, 9, 12, 16; XXVII. 4. **Monmouthshire**, VIII. 14; XI. 9; XIV. 5, 7, 8, 9, 11, 13, 15; XVIII. 10; XIX. 15; XX. 1, 2, 3, 5, 6, 8, 9, 10, 12, 13, 14, 15; XXII. 12; XXIII. 3, 11, 12; XXV. 3; XXVII. 8; XXVIII. 9, 13, 14; XXIX. 5, 13, 16; XXXIII. 3, 7, 11; XXXIV. 2, 3, 4, 6, 8, 9, 10, 11, 12, 13, 14. **Montgomeryshire**, X. 8, 12; XI. 6; XIII. 13; XIV. 8, 9, 10, 11, 12; XV. 9, 10, 11; XIX. 8, 9, 10, 11, 12, 13, 14, 15; XX. 9, 10, 11, 12, 13; XXI. 2, 3, 5, 6, 7, 10; XXVI. 1, 2, 3, 5, 6, 9, 10, 11; XXXII. 3. **Shropshire**, V. 12; VI. 5, 6, 7, 9, 10, 13; VII. 14, 15; VIII. 13, 14, 15, 16; IX. 13; XII. 12, 14, 15; XIII. 1, 5, 9, 13; XVIII. 8, 12; XIX. 2, 3, 4, 6, 8; XX. 1, 5, 13, 15; XXV. 8; XXVI. 3, 4, 6. **Staffordshire**, XXXVII. 7; XXXVIII. 10, 13; XL. 16; XLI. 1; XLVII. 3, 7, 10, 11, 15; LIII. 4, 8; LIV. 9. **Wiltshire**, LXIII. 10, 14; LXIV. 9; LXVI. 11, 15; LXVIII. 3, 4, 8, 12, 16; LXIX. 13; LXXIII. 5, 9, 13; (LXXIV. 1 and LXXIVA. 4); LXXIV. 5, 6, 8, 10, 11, 12, 14, 15; (LXXIVA. 4 and LXXIV. 1); LXXV. 2 (5 and 6); LXXVII. 6, 8, 10, 12, 14, 15, 16; LXXVIII. 5. **3s.** *each.*

(E. Stanford, London Agent.)

England and Wales. **Bartholomew.**

Plan of Manchester and Salford. By J. Bartholomew. Scale 1 : 10,560 or 6 inches to 1 stat. mile. London: W. H. Smith & Sons, 1901. *Price 2s. Presented by Messrs. J. Bartholomew & Co.*

This is a new edition, with roads, etc., added to bring it up to date.

England and Wales. **Johnston.**

Cycling and Automobile Map of London and the North. Scale 1: 190,080 or 3 stat. miles to an inch. London & Edinburgh: W. & A. K. Johnston. *Price 1s. 6d. each sheet. Presented by the Publishers.*

Another of W. & A. K. Johnston's cycling maps of districts round London, prepared from their "Three Miles to an Inch" map of England and Wales. It includes the country from Croydon on the south to about five miles beyond Huntingdon on the north, and from Maidenhead on the west to Chatham on the east. The principal roads are shown in red, and circles are drawn, with London as a centre, at intervals of three miles.

ASIA.

Asiatic Russia. **Russian Government.**

Map of the Southern Frontier Regions of Asiatic Russia. Scale 1 : 1,168,031 or 18·4 stat. miles to an inch. Sheet 2, Astrakhan and Orenburg. Military Topographical Department, St. Petersburg. 1901.

According to the index, this map is now nearly completed, there being only two more sheets to be published. The sheet just issued embraces the region between Simbirsk on the north and the Caspian on the south, and between the Volga on the west and Ufa on the east.

China. **Quarter-Master General's Department, Simla.**

Preliminary Map of the China Field Force. Scale 1 : 126,720 or 2 stat. miles to an inch. Quarter-Master General's Department, Intelligence Branch, Simla. Zincographed at the Survey of India Offices, Calcutta, August, 1901. *Presented by the Assistant Quarter-Master General, Intelligence Branch, Simla.*

The area included in this map is approximately from 35 miles to the west of Pekin to the Gulf of Pe-chili, and from 40° 16′ N. lat. to Tientsin and Taku. It consists

altogether of seventeen sheets and an index, according to which it appears that it is the intention at some future date to extend the limits of the map. It is a rough zincograph in black and white, but contains a great deal of detailed information, which has been brought together from all available sources.

Formosa. **Japanese Government.**

Map of Formosa. Scale 1 : 400,000 or 6·3 miles to an inch. The Survey Department, Tokio. *Presented by the Director of Japanese Surveys, Tokio.*

Since Formosa was taken over by Japan, considerable progress has been made with the surveys and mapping of the island. In addition to the 1 : 200,000 map, there has now been published the map here mentioned, which is a reduction of the former on half the scale, in six sheets. The lettering is in native characters.

Indian Government Surveys. **Surveyor-General of India.**

India, 32 miles to an inch. Third edition, 1898 (additions and corrections to 1900). 6 sheets.—Railway map of India, 48 miles to an inch, 1901. 4 sheets.—Railway System of India, 50 miles to an inch, 1901.—India, 64 miles to an inch, 1901. 4 sheets.—Lower Provinces Revenue Survey, 1 mile to an inch. Sheet 7, District Purneah, Additions to 1897, 1900.—Bengal Survey, 1 mile to an inch; sheet 171, District Durbhunga, Seasons 1846–49, 1900; sheet 269 (first edition), Seasons 1861–67 and 1881–89, District Darjeeling, 1901; sheet 270 (first edition), District Darjeeling and Jalpaiguri, Seasons, 1858–59, 61–67, and 79–83, 1901; sheet 36[illegible], District Mymensingh, Seasons 1854–56, 1901.—Bombay Survey, 1 mile to an inch, sheet 232 (second edition), Districts Poona and Ahmednagar, Seasons 1878-7[illegible], 1900.—District Buldána (Hyderabad assigned districts), 8 miles to an inch, 190[illegible]—Central Provinces, index map showing Cadastral Surveys, 1901; index map showing Forest Surveys, 1901. Index to the Standard Sheets of Upper and Lower Burma (new series), 1901. *Presented by H.M. Secretary of State for India, through the India Office.*

AFRICA.

Natal. **Simpson.**

New Military Map of the Colony of Natal. Compiled for Gen. Sir Redvers Buller, V.C., G.C.B., G.O.C., Natal Field Force. Published under the authority of Lieut.-Colonel A. E. Sandbach, R.E., Natal Field Force; Captain H. C. Simpson, N.V.R., F.I.D., Officer-in-charge of Mapping Section F.I.D., Maritzburg. Durban & Pietermaritzburg: P. Davis & Sons; London: E. Stanford; Edinburgh: John Bartholomew & Co. *Price* £2.

In the title this is stated to be a map of Natal, but it also includes considerable portions of the surrounding colonies. It has been specially compiled for military purposes, and, although the style in which it has been produced is decidedly rough, the best available information has evidently been utilized. In addition to the points fixed by triangulation, information has been supplied by local residents, railway survey engineers, and others, while full advantage has been taken of officers' reconnaissances and sketches. Natal is from plans and surveys in the office of the Surveyor-General of the colony, and from information furnished by local surveyors and others, while north of the Tugela Major Grant's map has been made use of. The portion of the Transvaal included is from Captain Simpson's own surveys, and from those obtained from the Surveyor-General's office, Pretoria. This map is doubtless the most complete and up-to-date that has hitherto been published, but it is to be hoped that before long it will be superseded by a regular trigonometrical survey. When complete the map will consist altogether of eight sheets, six of which are already published.

AMERICA.

North America. **Rand, McNally & Co.**

Indexed Pocket Maps of British Columbia, scale 1 : 2,407,680 or 38 stat. miles to an inch; California, scale 1 : 1,964,160 or 31 stat. miles to an inch; and Colorado, scale 1 : 1,000,000 or 15·8 stat. miles to an inch. Rand, McNally & Co. Chicago and New York, 1901. *Price* $0.25 *each. Presented by the Publisher.*

These are new editions. It is to be regretted that they are so roughly executed and indistinct, for they contain much useful information. In the place lists accompanying the maps of California and Colorado, the populations are given according to the census returns of 1900.

GENERAL.

ch Colonies. **Pelet.**

:las des Colonies Françaises. Dressé par ordre du Ministère des Colonies. Par ıul Pelet. Paris: Armand, Colin & Cie. Livraisons 7. *Price* 3 *francs.*

:he seventh part of this atlas, which has just been issued, contains a map of Madaar in four sheets, on the scale of 1 : 2,000,000, in addition to which there are many is of neighbouring islands on enlarged scales. Although only recently published, nap is dated January, 1900, and is consequently in some parts already behind the s as regards the geographical information it contains. This is especially notice- in the south of the island, where the map published this year by the Service raphique du Corps d'Occupation gives a good deal of information, although the n is left almost a blank on this map.

CHARTS.

alty Charts. **Hydrographic Department, Admiralty.**

rts and Plans published by the Hydrographic Department, Admiralty, during r and August, 1901. *Presented by the Hydrographic Department, Admiralty.*

	Inches.	
1 m	= 6·9	England, east coast:—River Thames, Woolwich to Erith. 2*s.* 6*d.*
8 m	= 1·4	Norway, south coast:—Nevlunghavn to Torbiörnskier. 3*s.*
9 m	= 1·4	Norway, south coast:—Torbiörnskier to Jœlöen. 3*s.* 6*d.*
0 m	= 1·4	Norway, south coast:—Torbiörnskier to Rauö. 2*s.* 6*d.*
3 m	= 1·0	Spitsbergen:—Magdalena bay to Red bay. 2*s.* 6*d.*
4 m	= 0·72	Denmark:—Copenhagen road and harbour. 2*s.*
10 m	= 2·9	Plans in the gulf of Genoa:—Rapallo bay. 1*s.* 6*d.*
07 m	= 0·2	River St. Lawrence:—West point of Anticosti to Saguenay river. 2*s.* 6*d.*
04 m	= 2·9	Cuba:—Guantanamo bay. 2*s.* 6*d.*
30 m	= 3·0	Cuba:—Nipe bay. 2*s.*
13 m	= 7·0	Cuba:—Santiago harbour. 2*s.* 6*d.*
04 m	= 5·8	Mosquito coast:—Blewfield lagoon. 2*s.* 6*d.*
95		Celebes, north coast:—Panang to Pulo Motuo. 2*s.*
08 m	= 0·5	Solomon islands:—New Georgia. 1*s.* 6*d.*
94 m	= 6·0	Sandwich islands:—Pearl river and lochs. 2*s.* 6*d.*
91		Africa, south-west coast:—Table bay to Donkin bay. Plan added:—Lambert bay.

D. Potter, Agent.)

Charts Cancelled.

o.	Cancelled by	No.
00 Plan of Magdalena bay to Foul bay on this sheet. 20 Plan of anchorage between Vogel Sang and Cloven cliff on this sheet.	New plan. Magdalena bay to Red bay	3203
57 Plan of Portofino on this chart.	New plan. Rapallo bay	3210
07 Magpie bay to point des Monts. 09 Cape Chatte to Bic island.	New chart. West point of Anticosti to Saguenay river	307
08 Plan of port of Guantanamo on this sheet.	New plan. Guantanamo bay	904
23 Plan of port Nipe on this sheet.	New plan. Nipe bay (eastern part)	1380
43 Port of Santiago de Cuba. El Portillo.	New plan. Santiago harbour	443
04 Blewfield lagoon.	New plan. Blewfield lagoon	1504
82 Lantau to Lankit islands.		

Charts that have received Important Corrections.

o. 1188, The World:—Coal and telegraph chart. 2007, Scotland, west coast:—ver Clyde from Dumbarton to Glasgow. 62A, Channel islands:—Jersey. 2100,

Channel islands:—Plateau des Minquiers. 122, Netherlands:—Mouths of the Maas. 2322, Netherlands:—Scheveningen to Ameland, including the Zuider Zee. 2593, Netherlands:—Ameland to Jade river. 2308, Norway, west coast:—Brand fiord to Leka. 2751, Spitsbergen. 300, Anchorages on the west and north coasts of Spitsbergen. 2669B, Channel islands. 1317, Balearic islands:—Majorca and Minorca. 2157, Sardinia:—Maddalena and adjacent islands. 199, Adriatic:—Brindisi to Ortona. 1483, Adriatic:—Channels to Venice. 2701, Adriatic:—Gulf of Cattaro to Corfu. 271, Newfoundland:—Cape Onion to Hare bay. 1734, Newfoundland:—St. Julien island to Hooping harbour. 280, Newfoundland:—Notre Dame bay. 2775, North America, River St. Lawrence:—Point Pizeau to Frechette island. 98, Places on the south coast of Cuba. 2512, Vancouver island:—Nanaimo harbour and Departure bay. 6B, Gulf of Aden, western portion. 100A, Gulf of Aden:—Ras Galwéni to Ras Hafún. 8E, Red sea, sheet V. 2134, Borneo:—Muara harbour and approaches to Bruni river. 2193, Anchorages between Mindanao and Celebes. 2562, China, south coast:—Canton river. 3026, China, south coast:—Macao to Pedro Blanco. 1180, China, south coast:—Approaches to Hong Kong. 1602, China, north-east coast:—Approaches to the Yangtse Kiang. 1203, Japan:—Uraga harbour. 951, Japan:—Kii channel to Owasi bay. 3155, Australia, east coast:—Flinders group. 983, North Pacific:—Marshall islands.
(*J. D. Potter, Agent.*)

North Atlantic Ocean and Mediterranean Sea. **Meteorological Office, London.**

Monthly Pilot Chart of the North Atlantic Ocean and Mediterranean Sea for September and October, 1901. London Meteorological Office. *Price 6d. Presented by the Meteorological Office.*

U.S. Charts. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for September, and of the North Pacific Ocean for September and October, 1901. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

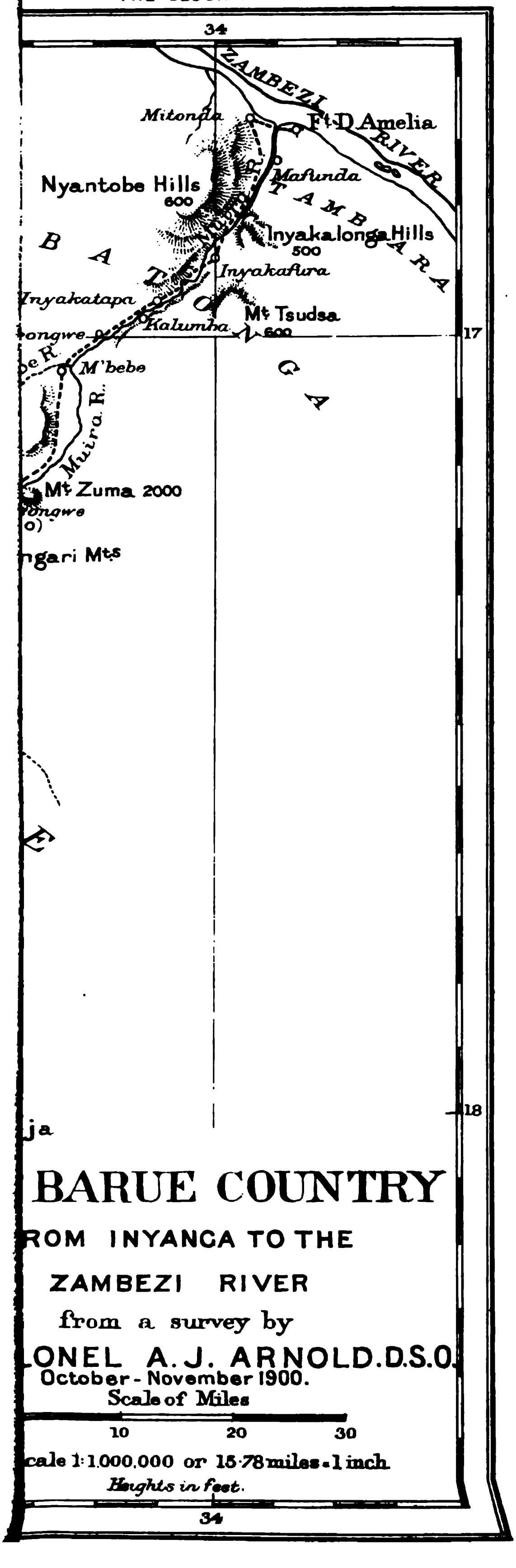
Pacific Islands. **Rooney.**

An Album of fifty-three photographs of people and scenery of New Britain and New Ireland, etc., by the Rev. Isaac Rooney. *Presented by the Rev. Isaac Rooney.*

An interesting series of photographs measuring about 7 × 5 inches. They are well taken, and, as will be seen by the titles, thirty-three represent types of natives, whilst the remainder principally illustrate characteristic scenery and mission stations.

(1) Port Hunter, Duke of York island; (2) New Ireland scenery; (3) Port Hunter, looking north; (4) Remains of French settlement, New Ireland; (5) Wesleyan mission house, Kabagada, New Britain; (6) French settlement, New Ireland; (7) Teacher's house, Port Hunter; (8) Native feast, Duke of York island; (9) Marquis de Rey's settlement, New Ireland; (10) Sacred canoe, Port Hunter; (11) Teacher's house, Duke of York island; (12) Small native church, Duke of York Island; (13) Native chief and sacred canoe; (14) Native houses, New Britain; (15) Mouth of river, New Ireland; (16) Dukduk (a sacred society); (17) New Ireland river; (18) Native dance, New Britain, 1879; (19) Natives of Port Hunter, 1879; (20) Survivors of Marquis de Rey's expedition rescued and brought to Port Hunter by the mission, 1879; (21) Aminio Bale and wife (Fijian teachers); (22) Samoan teacher and wife; (23) Samoan teacher and wife, Duke of York island; (24) Wesleyan mission house, Port Hunter; (25) Port Hunter; (26, 27) New Britain chiefs; (28, 29) Samoan women; (30, 31) Chief and family, Port Hunter; (32) King Dick and his two wives; (33) Tongan teacher and New Britain natives; (34–39) Duke of York natives; (40) Son of chief (Warrawarrum); (41–53) No titles.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.


34
ZAMBEZI RIVER
Mitonda
Ft D Amelia
Nyantobe Hills
600
Mafunda
TAMBARARA
Inyakalonga Hills
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BA
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ja
BARUE COUNTRY
ROM INYANGA TO THE
ZAMBEZI RIVER
from a survey by
ONEL A.J. ARNOLD.D.S.O.
October - November 1900.
Scale of Miles
10
20
30
cale 1:1.000.000 or 15·78 miles = 1 inch.
Heights in feet.
34

The

Geographical Journal.

No. 6. DECEMBER, 1901. Vol. XVIII.

THE PRESIDENT'S OPENING ADDRESS, SESSION 1901–1902.*

It has been customary for the President to address you briefly, at the opening of the session, on the geographical events which have taken place during the recess. I have much to say on the greatest undertaking this Society has ever entered upon, the Antarctic Expedition, and on collateral subjects, but I will take another opportunity of doing so, as we are now all anxious to listen to Sir Harry Johnston.

It would, however, not be right if I did not allude to the losses geography, and especially this Society, has sustained since we last met. Our Gold Medallist, Baron Nordenskiöld, has passed away, if not at an age we hoped to see him attain, still in the full ripeness of abundant, most valuable work. I know of no geographer who has combined such great achievements in the field with imperishable work in the study. The explorer of the icefields of Greenland and Spitsbergen, the discoverer of the North-East Passage, was also the author of the Facsimile Atlas and of the Periplus. He was, without comparison, the greatest authority on mediæval cartography of his generation. In the preparation of the former work, he sought my co-operation; we have maintained an intercourse and correspondence on geographical subjects for upwards of a quarter of a century, and I am among those who mourn for the loss of this gifted man of science as for an attached friend.

Our Vice-President, Admiral Sir Anthony Hoskins, has also passed from among us. This distinguished naval officer took a very warm interest in our Society. We were most fortunate to have secured his services, and to have been able to profit by his judicious counsel. All he did was done very quietly and without ostentation, and few know

* Read at the Meeting of the Society, November 11, 1901.

how much geography is indebted to him. As regards the Antarctic Expedition alone, the important help and countenance it has received from the Admiralty is mainly due to the influence of our late Vice-President. His place will not be easy to fill.

But perhaps our most grievous loss, the loss we feel most keenly, both as geographers and friends, is that of the young and brilliant officer who lately won a patriotic soldier's death near Pretoria. The youngest colonel in the army, no other fact is needed to prove the value of his military services. But it is not for us to discuss them here. We mourn for the loss of young Vandeleur as a trained scientific traveller, as the most promising among the geographers of the younger generation. Older men have done their work, and our grief at their loss is tempered with satisfaction that they have been spared to do so much. But how sad it is to see a bright young life, so full of promise, cut off in its prime! We all remember the days when young Vandeleur told us of his geographical work during the Niger campaign on May 31, 1897, and the account he gave us of Uganda on November 23, 1896. How bright and sympathetic he was, how thorough and painstaking; how certain it seemed to us that in him we had the promise of a great geographer in the years to come! I saw him last when he came home badly wounded in the summer, and found the same enthusiasm, the same interest in his own work combined with sympathy for the work of his geographical associates. The ardent African traveller was a subscriber to the Antarctic Expedition. He went back to his responsible duties full of high hopes and patriotic zeal. Now, alas! all buried in his grave. We have left to us the memory of a splendid career too soon cut short; and future travellers and geographers will derive benefit and encouragement by a contemplation of the life-work of that most gallant and accomplished guardsman, Seymour Vandeleur.

It is now just seven years since we had the great pleasure of welcoming our old friend and associate, Sir Harry Johnston, and listening to his graphic account of his Nyasaland government. We again have the pleasure of giving him a welcome on his return from Uganda, and I will delay no longer in requesting him to address you.

SURVEYS ON THE PROPOSED SUDAN-ABYSSINIAN FRONTIER.*

By Major C. W. GWYNN, D.S.O., R.E.

The map published herewith gives the main geographical results of the surveys conducted by me in the neighbourhood of a section of the proposed Sudan-Abyssinian frontier during the winters of 1899–1900 and 1900–1901.

* Map, p. 656.

During the first season, assisted by Lieut. L. C. Jackson, R.E., I carried a survey from Roseires on the Blue Nile to Fashoda on the White Nile, joining Major Austin's work on the Baro, about 70 miles in a straight line above Nasser. A reduction of the maps then made has already been published in this *Journal*, with Major Austin's paper.* Since this map was published, I have, however, had an opportunity to determine the longitude of Roseires, my starting-point, by telegraphic comparison of times. The result is to move the whole of the topography between that point and Abajala on the Garre (a tributary of the Sobat) 1′ 41″ of arc to the west. Considerable additions have been made to the map between Dul and the Blue Nile, and the spelling of some of the names has been revised.

Last winter I accompanied Colonel Harrington, the British Agent and Consul-General in Abyssinia, to Addis Abbaba, and proceeded thence to the frontier along the road originally explored by Mr. Weld Blundell, joining my previous work at Fazogli. Having spent some weeks in surveying in greater detail the country between Fazogli and Dul, I turned north and carried the survey across the Dinder and Rahad valleys to Gallabat. Thence, as the rains had well set in, it was necessary to return to Khartum. The most northerly place, which was well fixed, was Doka, and unfortunately it was not possible, in the time available, to rigidly connect that point with the point at Gedaref telegraphically determined by Colonel Talbot, R.E.

The positions of Wad Medani, Sennar, and Roseires are now telegraphically determined, so the considerable error in longitude which existed on all old maps has been eliminated from the position of the Blue Nile. South of Roseires to the Baro,* along the western scarp of the Abyssinian plateau, the longitude depends on a continuous line of latitudes and true azimuths. The position of a number of prominent peaks has been intersected and calculated from a series of latitude bases, and the detail survey has been made on a plane-table working from these points.

The instrument used in this portion of the survey was a 5-inch transit micrometer theodolite, by Messrs. Troughton and Sims. The altitudes given in this portion of the map depend on a boiling-point value for the summit of Jebel Fazogli, from which other altitudes have been worked by vertical angles corrected for curvature and refraction.

North of the Blue Nile to Jebel Doka *viâ* Gallabat, the survey also practically depends on a line of latitudes and azimuths, but in the first instance the distance from Jebel Fazogli to Jebel Gubba, determined from a latitude base, was taken as the base for a triangulation run with a 3-inch transit theodolite to Jebel Belula, south-east of Gedaref. The points on this triangulation were used in the plane-table survey of

* See vol. xvii. p. 572.

topographical details, but the whole was subsequently adjusted to observed latitudes (5-inch theodolite) at Jebel Belula and Jebel Doka. The longitude of Jebel Doka depends on three observed azimuths—Jebel Fazogli, Jebel Abu Ramla, Jebel Halawi, Jebel Doka.

While at Addis Abbaba I had an opportunity of measuring a base 18,298 feet long. From this base a triangulation was carried to the mountains in the neighbourhood with a 3-inch transit theodolite. The latitude of our station was observed (with the same instrument, four pairs north and south stars), and a value in longitude was assigned to it depending on Captain Swayne's value for the camp of the Rennell Rodd Mission, determined by two occultations of stars by the moon.

Proceeding to the frontier, a very rapid triangulation was carried from the points thus determined till the points fixed on the previous survey became visible, and the plane-table survey was worked from

BLUE NILE BETWEEN WAD MIDANI AND SENNAR.

these points. The closing error on the points determined in the previous year was approximately 2′ of arc. In drawing the map this error has been eliminated, and a fresh value for the starting-point at Addis Abbaba has been plotted. As, however, the triangulation was run with a very small (3-inch) theodolite, and many of the points observed to were unsuitable beacons, I do not consider there is any warrant for rejecting Captain Swayne's value for Addis Abbaba. I have not, however, considered it worth while to distribute the 2′ error, as it probably was not gradually accumulated, but was introduced at definite points which there is no means of identifying. The heights given between Addis Abbaba and the frontier are merely aneroid readings. Vertical angles were to a certain extent observed, but the results have not yet been computed.

A list of the points determined is published in the latest issue of accessions to the Intelligence Department list of latitudes and longitudes, and can be seen in the Society's library.

AUDIENCE CHAMBER, PALACE ADDIS ABBABA.

Notes on the Journeys.

Leaving Omdurman on November 19, 1899, Lieut. Jackson and I sailed up the Blue Nile to Roseires with our escort of Sudanese in three gyassas. Owing to the exceptionally low Nile, progress was painfully slow and frequently interrupted by sandbanks.

The men, however, were available for towing, and better progress was made by us than by the boats we passed, which had to depend on the wind only. The river winds considerably, and even though the wind comes pretty steadily from the north, there were few days on which it was favourable throughout. Ten mules were brought from Omdurman, but it became obvious, after the first day, that they could easily keep up with the boats, and they were consequently landed, giving a very welcome amount of room on the overcrowded boats. Short halts were made at Wad Medani and Sennar to fix the position of these places telegraphically, and at the former place we received the news of the Khalifa's death. At Karkoj a large number of donkeys had been collected for our transport, and six weeks' supply of grain was procured there for our journey south from Roseires. The donkeys, seventy in number, were marched without loads to Roseires, and the provisions were carried by water. On December 14 we gladly parted from our boats at Roseires, as our numerous boxes and stores had left us little elbow-room, and the awning, never of the best, had almost disappeared. Rats and cockroaches had increased and multiplied on the voyage, and neither the boat nor its crew had become more savoury. Looking back on the voyage now, however, one can realize the possibility of having a

very pleasant trip in a well-equipped boat, with time available for shooting excursions. Much of the river is very pretty, and the myriads of water-birds are an unfailing joy.

Two days were spent at Roseires arranging loads, getting out instruments, observing, etc., and on December 17 we started for Fazogli. From the first all our transport arrangements gave every satisfaction, and our Sudanese worked untiringly under Faraz Effendi, an officer of the 12th Sudanese who had been promoted from the non-commissioned ranks for distinguished conduct at the battle of the Atbara. I regret to say that after his return to his battalion he developed fever and died. The river was crossed at Abu Shaneina in one of the rough-looking but effective native boats peculiar to the Blue Nile—boats which have no framing, but depend for their strength on the planking, which runs up to 3 inches in thickness. A couple of thwarts help to prevent the boat spreading. From Fazogli we worked south through Keili, skirting the foot of the Beni Shangul plateau. Population is sparse, and the races much mixed. The rulers are generally descended from the Fung or other tribes further north, and originally came into the country as traders. The aboriginal races are Bertas

BATTLE OF ADUA: MURAL DECORATION IN CHURCH AT LEKEMPTI.

and Buruns, who live among the rocky hills, their houses wedged in among the huge sienite boulders in the most inaccessible places. The Bertas are the more numerous, and the Buruns live very much scattered,

further out from the foothills. The Bertas are a very black race, large, well made, but slothful and stupid to a degree. Going up to their villages in the hills, one finds them stretched out sunning themselves on the rocks, looking for all the world like great black snails. Funny little black pigs and stringy fowl share the huts on equal terms. Durra must be grown somewhere, but there is little sign of cultivation anywhere among the low-growing forests which cover the face of rough stony country. Of course near the river population is thicker, and a good area is tolerably farmed.

ABYSSINIAN PRIEST, LEKEMPTI.

As far south as Kirin there is great scarcity of water, and no perennial streams are met with, with the exception of one flowing at the northern side of Jebel Dul. The tilt of the strata appears to turn all the water from the Beni Shangul plateau back into the Tumat and Yabus valleys, for one finds delightful little streams running east from the very edge of the escarp. South of Kirin in Amam there is a break in the scarp, and perennial streams run both ways. This country is

well watered, but is thinly populated, and the whole face of the country is covered with bamboo forests. Crossing the Shakadobi range by the pass at Jebel Egu, where the Abyssinian and Galla armies repelled the southern advance of the Dervishes, one leaves the Mohammedan Arabic-speaking regions (Arabic is the *lingua franca*, though there are various dialects among the aborigines) and enters Galla territory. The change of scene is almost as remarkable as the difference in the appearance of the people and their language. There is a dense population, and the whole country is under cultivation excepting on the higher hills, where there are forests of beautiful trees and glades whose bracken and blackberries make one forget he is in Africa. Though the country has been thoroughly cleared for cultivation, sufficient numbers of large trees have been left grouped round the farms to break the monotony of the landscape. This very attractive country extends all round the headwaters of the Yabus and northern slopes of Tulu Wallel into Wallega, though the Yabus itself flows in a wide marshy valley useless except as a hunting-ground.

In contrast to the Gallas found on the outskirts of Somaliland, who appear to have adopted largely the Somali's nomadic life, these Gallas, and all those of the Western Abyssinian plateau whom I have met, are essentially an agricultural people, though they breed fine cattle and a good many horses, the latter of a very light, rather poor class. The farm huts stand close together, but the people do not collect into villages, though in the case of important men the huts of the farm servants almost constitute a village. Throughout the country there are, however, recognized "gabas," or market-places, where markets are held on regular days. The top of a small hill near some big farm is generally selected, and the market is held under the superintendence of the local headman, who decides all questions of broken contracts, etc., on the spot. Practically the Abyssinians have not touched the native organization here, and the old code of laws and customs exists, except that capital cases must be brought to Addis Abbaba.

Up to this point we had been traversing country which had to a certain extent been explored by Schuver, and his work had on the whole been found to be very accurate in detail, though in the southern portion of his map a considerable error in latitude had appeared, while of course many villages had disappeared and others sprang up. Standing at Gobo and looking south towards the Baro, little could be seen owing to the haze, but it was evidently from this point that Schuver had seen the Garre in flood in the neighbourhood of Abajala, which led him to mark Lake Haarlem on his map. Schuver was much liked and respected throughout the country, and a great impression had been produced by his dog, which must have been a big Newfoundland. He is still always spoken of by the Gallas as Abu Sari ("the father of the dog").

At Gidami we came on the tracks of another explorer—the ill-fated Bòttego—and our camp was for some time at the foot of the hill on which he met his death. One of his books, a medical handbook, was presented to me, and the natives gave apparently an accurate description of the unfortunate conflict. There can be little doubt that if Bòttego had consented to relinquish his design of pushing north to Kassala, and had consented, as the natives desired, to go to Addis Abbaba, no attack would have been made on his party. The Gallas were, however, afraid of incurring the Emperor Menelek's displeasure by allowing an armed force to pass through their country without authority, and consequently attacked when Bòttego insisted on proceeding.

GUMZ VILLAGE AT JEBEL MATONGWE.

Leaving the Lega Galla country, we descended the great southern scarp of the Kusai range, which projects like a wall for some 30 miles at right angles to the general line of the scarp to the plateau. Once more we entered an almost uninhabited, waterless tract, and it was with great difficulty that we were able to obtain guides. This is a great elephant country, and, indeed, game of all sorts appears to abound, though, as our provisions were none too plentiful, and the accounts of the difficulties likely to be met with on foot were not reassuring, we did not dare to waste time shooting, but pushed on as fast as possible.

On March 15 we reached the Baro at Kaich, which is apparently

the most easterly Nuer village. To the east our guide said we should have found Nyuaks. The Nuers, in spite of a rather evil reputation, proved most friendly, though we tried them rather highly by appearing in their village without warning at 9 o'clock on a dark night. These eastern Nuers are a wonderfully fine race physically; they are very well built, and must average very nearly 6 feet in height. They are chiefly distinguished from the Nuers further west by the absence of disease, and skins unbroken by the sores and marks which disfigure most African races. Their hair is bleached even a brighter red than that of the more westerly tribes, and it is generally worn rather long and dishevelled. Poor Wellby speaks of the Nuers as being a red-haired race, but of course the colour is due to a bleaching process effected by not very nice means inside a helmet of clay. The result is a brilliant Celtic red. These Nuers are very particular about their night clothing of wood-ash, which gives them a very ghostly appearance as they move about in the morning mists. The heat of the day soon produces quaint river systems over their bodies, uninterrupted by any clothing. Generally speaking, we found the eastern Nuers a very attractive people, bright and intelligent, though absolutely wild men. Further west in the neighbourhood of Nasser, the contact with the Dervish and old Egyptian occupation had produced the elements of civilization, but had made the people much less pleasant.

Few countries could be less attractive than the Baro valley between the Pibor and the foothills. When we traversed it it was a dried-up marsh, and all the grass had been burnt, leaving a thick choking layer of black ashes on the ground. The heat was great, even the nights giving frequently a minimum temperature of 100° Fahr. Still there was no great difficulty in getting through the country, as there would be when the ground was still a swamp and the grass standing. Some 4 miles or so from the river a forest belt indicated the flood limit, and here the Nuers had their wet-season villages and patches of cultivation. Very well built they are, too, and very different from the fishing huts on the river-bank. During the wet season the latter are deserted, and communication from the river to the inland villages would be most difficult.

Owing to the lowness of the water, we had to march all the way to Fashoda, cutting off a corner from Uryong, a most dreary, waterless march across dried-up swamp. Fashoda was reached on April 1, and there two gyassas, returning light from the sudd-cutting party, were obtained to carry our stores and party north. The remaining transport animals were marched along the bank, and the Sudanese, with the prospect of restoration to their families in sight, brought them along at a fine pace. At Goz Abu Guma we were overtaken by Sir William Garstin's steamer returning from the sudd, and April 26 saw us back in Omdurman.

BAMBOO-COVERED COUNTRY, AMAM.

JOURNEY FROM ADDIS ABBABA TO GALLABAT *viâ* FAZOGLI.

On March 12, 1900, I started from Addis Abbaba to Fazogli with a few Abyssinian and Somalis as personal attendants. His Majesty the Emperor Menelek had given personal orders that every assistance should be given me on my way to the Sudan, and his orders were obeyed in the most liberal spirit. Little need be said about the country traversed, as it has recently been described by Mr. Weld Blundell and in M. Michel's most interesting account of the Bonchamps mission in his book 'Vers Fachoda.' That the country to the east has suffered much in the Abyssinian wars is evident when it is compared with the extreme westerly districts, which surrendered their independence without a struggle. I should doubt, however, if at the best of times the more central part of the plateau had equalled the Didessa and Yabus valleys in fertility. To the east and in Shoa the old Galla organization has been completely broken up, though districts and subdistricts bear the old Galla tribal names. At Lekempti, however, Dejajmach Kumsa is a pure-bred Galla, and his subordinates are Gallas too, though he has to support three thousand men of Dejajmach Demasi's Abyssinian frontier army. Here one begins to find the same type of country and state of things as in the Lega Galla country described above. The country is probably quite as fertile, but the population has evidently been considerably reduced. Crossing the Didessa valley, which, like that of the Yabus, is a low marshy game country, one ascends a formidable scarp bounding Wallega on the east. The whole of the southern portion of Wallega is thickly inhabited and fertile, but the northern extremity of the peninsula between the Yabus, Blue Nile,

and Didessa has been depopulated by the Dervish raids. Near the Yabus itself the black population is found on both banks of that river. Owing to heavy rain and pressure of time, I was unable to do anything to amplify Mr. Weld Blundell's interesting discovery as to the course of the Blue Nile, but native report fully confirmed his account.

For the greater portion of the way from Addis Abbaba to Wallega I had the good fortune to travel in company with M. Hugues le Roux, the distinguished French author and journalist, and M. le Baron de Souci, who were travelling to visit M. Ilg's gold-mining concession. I have heard that M. le Roux fully explored the country in the neighbourhood of the Didessa Blue Nile junction, and his exploration will, I hope, do much to extend our knowledge of the topography of this region, which till now has been very indifferently charted.

Passing through Beni Shangul, I reached Fazogli April 13, and, being met by a party of Sudanese under Captain N. M. Smyth, V.C., Inspector of the Sennar district, proceeded to map more thoroughly the northerly portion of the district traversed during the previous year, and to extend the survey in the direction of Gallabat. In the district

COTTON MARKET, GIDAMI.

immediately north of the Blue Nile the aboriginal Guniz tribe lives under very much the same conditions as the Bertas do in the country south. They are a smaller race than the Bertas, but appear to be more active and intelligent. Their rulers are usually aliens. The Gubba group of mountains does not form part of the general Abyssinian scarp, but is an outlying group of very rocky hills intersected by flat narrow valleys. A remarkable feature of the scenery is the number of bare needle-like rocks, some of them, like Jebel Matongwe, rising straight out of the plain. Jebel Abu Ramla is a curious mountain block with an almost crater-like summit and steep sides. We marched east from Abu Ramla up the Dinder valley to Dunkur. The chief village is about in the same latitude as is assigned on existing maps to Dunkur, but this village is really about 10 miles south of the old village, which was consequently very much out of position. In fact, the old maps of this region, both as regards topography and tribal information, are quite worthless. From Dunkur we turned nearly due north and skirted the foothills of the Kwara plateau, which, with the great mountain masses of Jebel Kobai, Jebel Belia, and Jebel Bafa, form the true limit of the main plateau. The country traversed was thickly wooded with low trees even on the hilltops, and thoroughly unsatisfactory to survey. Out to the west, however, the detached hills stood up boldly from the plain and formed good landmarks. The country is thinly, and for many miles entirely, uninhabited, Dervish raids having almost depopulated it.

Gallabat is a place rapidly recovering its old importance, and it is interesting to find that the majority of the inhabitants are settlers (or the descendants of settlers) from Darfur, who, returning from Mekka, have formed a colony here.

From Gallabat we returned by the prosperous town of Gedaref (Suk Abu Sin), which has already recovered its position as a great commercial centre, and thence struck across the desert to the Blue Nile to Wad Medani, where we found a steamer waiting to take us to Khartum. Wad Medani was hardly recognizable as the squalid native town where Jackson and I had spent two unhappy days a year and a half before. At Fazogli the immense difference a little over a year had made in the general prosperity of the district had struck one. There, it was doubtless the sense of security of a settled government which had brought about the change, without any particular effort on the part of the government; but at Wad Medani new buildings and gardens gave ocular evidence of the existence of a government.

NOTES ON THE ANTHROPOGEOGRAPHY OF ARGENTINA.*

By Dr. FRANCISCO P. MORENO.

OUR geographical knowledge of Argentina has been considerably increased during the last few years. The Andes have been explored, as well as the Patagonian tablelands and the Fuegian islands. Important discoveries have also been made in the geology, palæontology, and anthropology of these regions. The ancient relations of South America, not only with the antarctic lands, but with Africa, India, and Australia have been shown, as well as the existence during supra-jurassic times before the upheaval of the Andes, of a great range of mountains to the west of Chile where the Pacific extends to-day. Palæontology has confirmed these geological relations. The extension of the Gondwana flora to Argentina, and the identity of some South American vertebrates with those of Australia, are no longer matters for conjecture. Changes, also, in the relief of the southern part of the American continent, in the contour of the coast, and in climatic conditions, have been noted in recent times, and some of these results are of remarkable importance when viewed in connection with the distribution of mankind. Without doubt, geographical conditions in prehistoric Argentina afforded unlimited hunting-grounds, arable lands, and homes to vanished races of men. I think, then, that it is not beyond the programme of this section to attempt a general enumeration of the people who once inhabited it.

I.

When, in 1873, I visited for the first time Patagonian lands, I was struck by the number of human types in the graves of the old Indian encampments in the valley of the Rio Negro. It seemed to me that here was a general burial-place of all the American races during their forced migrations to the extreme south of the American continent. Afterwards, when I crossed the Argentine territory, I looked for the races represented in these graves, and little by little I penetrated the great mystery; and comparing the lost races with those existing to-day, by the remains of their industry left to us, and by a knowledge of the geographical environment in which they wandered, it is possible for me to-day to say something which may induce others to take a greater interest in the anthropogeography of South America before the times of Columbus.

I will not discuss the origin of the primitive South American whose remains have been discovered in the Brazilian caves and in the Pampean

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loess in close association with the bones of extinct animals. The confusion produced as to the epoch of extinction of these mammals by the exploration of the Mylodon cave in South Patagonia would require a long explanation, which time does not permit of to-day; neither will the question be discussed whether this primitive man is of the same type as the Eskimo, or whether he is only a descendant, or whether they are both representatives of entirely different peoples separately developed. But as introduction to this short account, I will only say that the Pampean sea, the Moxos lake of Bolivia, and the Amazonian lacustrine area, so well described at the Bristol meeting, and at the Royal Geographical Society, by Colonel George Earl Church, have had great influence on the geographical distribution of man in the early history in South America. By these broad waters the Brazilian land-mass was separated from the Andean land-mass. There is no doubt that man lived in South America in early pleistocene times, and it is also undoubtedly a fact that during the pleistocene period a great part of that continent had not the same physical features which it bears to-day. Very probably the Caribbean sea had not its present extension. The Andes had not reached their present elevation, and lands existed to the west and to the south-east; these are all geographical features necessary to explain many facts observed in the distribution of man in America.

In the southern part of the Brazilian or eastern region, which very probably was more extensive than at present, the dolichocephalic or long-headed type developed; in the Andean region, the brachycephalic or round-headed type; and a third intermediary type came later on from the Columbia-Venezuela region in the north. The first two types developed separately, till, with the slow decrease of the Pampean sea and of the big lakes, inter-communication was possible. In those times, with the appearance of the pampean loess above the sea, other lands in the neighbourhood sank, the great mammalian fauna commenced to decay, and the Atlantic coast took its present contour (leaving only as proofs of the past existence of the lost lands, the polishing of rocks by wind-blown sands from these lands); sea arms advanced 300 miles to the north of its present boundary, sufficiently deep to allow the passage of whales, and great rivers flowed into the large bays of San Borombon or Bahia Blanca; hundreds of lakes extended on the now low lands, and then men of the east and of the west met, and the mixture of the types commenced.

In that age the climate was different from that of the present. The Andes had not formed their present continuous barrier between the Atlantic region and the Pacific region; vast glaciers still existed in the northern lands, descending to the valleys of the western highlands and giving a damp climate to the arid regions of to-day. In Patagonia the glaciers advanced eastwardly. While the geographical conditions were

favourable to human life in the north, not only men but huge animals could pass easily across the Andes; in the south the ice-sheet closed the field for the development of man, and he only reached the low depressions by the east.

In the Brazilian region dolichocephalic men advanced slowly in culture, tribes were formed, dissensions arose between them, and forced migrations commenced. Some of the tribes acquired more industries than others, which spread over the hydrographic net and along the Atlantic; the remains of this industry, from the Paraguay river to the Amazon and the Atlantic, show the intimate relations between the tribes in early times.

While nomadic conditions governed these eastern men, in the Andean regions brachycephalic men initiated a different culture, adapted to the different geographical features, and created the first settlements. Meanwhile a third type, mesocephalic, advanced from the north, sending its representatives to the east and to the west, during its march into the regions occupied by the two others, and thus new mixtures appeared in race and in culture.

To this third type pertain, I think, the petrographs which have been observed in all South America. I will call the first type the south Brazilian type, the second the Andean type, and the third the Tupi-caribbean type; from these three descend all the old South American tribes. Beside these types other people came to that continent after. Undoubtedly there is a connection between South Americans and North Americans, and also with the peoples of Polynesian origin, but the basis of the entire population was the union of the three types mentioned. I shall not inquire here into the common origin of some of the Pacific Oceanic races with those of South America, or into the similarities which they offer, explainable only by old land connections; but I will merely mention that in the graves of Rio Negro there are human remains that cannot be referred to any living race of South America, but only to those of Polynesia. Some of the skulls from Rio Negro and the Calchaqui region are of Papuan type. Maori stone implements have been discovered at Cuzco in Peru, and at Santiago del Estèro in Argentina; carved wood clubs, entirely similar to those of the Marquesas islands, have also been brought from the ruins of Truxillo in Peru, and from Quillota in Chile, these being preserved in the La Plata Museum, while others have been discovered in Colombia, Ecuador, and other places in Peru. The similarity of some Polynesian monuments with those of Peru is well known, but it is unnecessary to go outside America.

Several of the human types of the Rio Negro pertain to races totally extinct. Amongst these are the Neanderthal and Tasmanian type, others dolichocephalic which is connected with the Botocudo type of south Brazil and to the men of the mounds of Rio Grande and Uruguay. A

third type, mesocephalic, represents the Fuegian type of the Yagan and the Alakalufs which, while speaking two different languages, seem to be of the same race. A fourth type is that of the Onas of Tierra del Fuego. A fifth represents the Tehuelches of the old race; a sixth the great Patagonians or the Ahóneckenkes; the seventh the Gennakens (or the true Pampas); and eighth a type very much resembling the Calchaquis and Huarpes of the north-west part of Argentina. These are normal types, but there are others showing artificial deformations not less interesting. Every kind of skull deformation is represented in these graves—those of the Aimaráes, the Pampean races, the Calchaquis, the old Peruvians, those of the North American Indians, and some also of Central Asia and Europe.

Some of these types represent races that have arrived in Patagonia from the north, following the Atlantic coast. In the burial-grounds which I have explored in the western regions I discovered only the Ahoneckenke, the Gennaken, and the Araucanian type, while some in the neighbourhood of Lake Buenos Aires pertained to the Chonos Indians of the Pacific coast. It is also necessary to say that in the old encampments to the south of Chubut, from which the La Plata museum has obtained a good number of human remains, the number of types diminish. There are in the extreme south only those of natives still existing, which seems to show that the other types became extinct before reaching these latitudes.

I will now try to show who are the present representatives of these men, and the places in which they now live. Of the primitive dolichocephalic type there does not now exist any living individual; it belongs to an extinct race. This is not the case with the first mesocephalic type which is represented by the Yagan and the Alakaluf. I have known personally the two individuals who have been photographed, and can state certainly that they do not in any way answer to the popular idea of the inferiority of these races. They both learned to read and write, took an interest in drawing, spoke a little English and sufficient Spanish. The Yagan was amiable, sensible, and kind, while the Alakaluf was somewhat gloomy, inclined to theft, but kind with children; both were interested in all they saw; the second was extremely skilled in the making of stone arrow-heads, while to the first the La Plata museum owes the possession of many very valuable palæontological specimens. This apparent inferiority is due to the land environment in which they obtain their food, principally by fishing in the fjords in their canoes; but a certain number of Yagans now work in the Argentine settlements of Beagle channel, and several have become good sailors. It is impossible to decide to-day whether these two races proceed from the southern Brazilian stock; but several of their usages undoubtedly belong to a former manner of living. Their masked dance, and ornaments, for example, are remembrances of an old sunny fatherland. In their present

cruel surroundings they are losing much of the better culture brought by their ancestors, and are rapidly becoming extinct.

The second mesocephalic type is that of the Onas, a tribe only very recently known to Europeans. When travelling in Patagonia twenty-five years ago I met more than once some men living with the Tehuelches having an ethnical type different to the people with whom they lived. According to the latter, they were descendants of other Indians. These men were identical with the Onas, and were the issue of men left behind during the migration to the south. It is a matter for conjecture how the Onas crossed Magellan strait, as they do not know the use of canoes, but there are two suggestions to offer in explanation: (1) that they arrived there when a broad glacier and its moraines occupied in part the depression of the strait of Magellan, bridging the continent and the island; or else (2) that they crossed before the formation of that depression. With the Onas, as with the Yagans, their reputation for inferiority is not altogether deserved, and when they have come in contact with the colonists their characters modify rapidly. There are among them, men and women, intelligent individuals, though at first meeting with civilized people they appeared stupid with astonishment and suspicion. The Onas are huntsmen, not fishermen, and undoubtedly their original fatherland is situated further north. The vicissitudes through which they have passed in their migrations are unknown, but it is not hazardous to say that their ancestors lived in more fertile lands. Like the Tehuelches and Gennakens, they hunted in the great plains of the midland of Argentina.

It is not generally recognized that under the Araucanian name of Tehuelches there existed two different types. The old Tehuelches (now extinct for twenty years) were greater in height, of darker complexion, with well-developed bodies, and speaking a different language. The other Tehuelches, of which a few representatives exist to-day, though great in height, are slender in general proportions, and of a type which may have resulted from the mixture of the old one with the Onas and Gennakens. To this type belonged the men whom Magellan saw. I do not think that the old Tehuelches were numerous, and in the burial-places of the Rio Negro are very few of their remains, and I have not obtained others from the ancient encampments or graves that I have examined in many other parts of Patagonia; but the common Tehuelche type is spread over all the southern part of the continent, mixed with Gennakens and Araucanians, and there are proofs of the existence of that race in central Argentina as late as the middle of the eighteenth century. Next to the Tehuelches are the Gennakens, which have many analogies with the Tehuelchean type, but they are of smaller stature, and speak another language. This race, now represented by very few individuals, has had the largest influence amongst the nomadic plain tribes in South America. It migrated from the north, and it

is possible to trace it from the northern plains of Argentina southward to the centre of Patagonia, where its last representatives are now found. These were the men who lived in Patagonia and Tierra del Fuego at the time of the voyage of Magellan; the Araucanians were confined to the two slopes of the Andes between 35° and 41° S. lat., and some few Chonos occasionally passed from the western channels to the eastern valleys by the Andine reaches of the south; the mummified Indian which I discovered in 1877 in the Lake Argentino being the single proof that the enigmatic men bearing the macrocephalic deformation, whose remains I obtained from the Rio Negro burial-grounds, extended as far as 50° south.

The anthropological types which I have mentioned as having lived in the southern extremity of America were men of very low culture, but amongst them, however, were representatives of higher types. There have been discovered in the ancient encampments a few fragments of somewhat elaborate pottery, evidently brought with the migrators, for neither the Pampean, the Patagonian, nor the Fuegian tribes were potters. In the La Plata Museum we have some vessels in a good state of preservation from the Chubut valley, analogous to those used in the provinces of the north-west of Argentina, and with the same have been discovered perforated turquoises, which undoubtedly come from the same provinces, as there, in the old times, this stone was extremely appreciated for use as necklaces and mosaics. Were this pottery and these turquoises brought by migrants, or were they the result of commerce? I am inclined to think that they were brought by the nomadic Patagonian and Pampean tribes in their periodical marches to the north and south.

I have said that amongst the remains buried in the ancient encampment of the Rio Negro were skulls showing a great number of types of artificial deformation skull. These remains caused me to look for the northern races of Argentina. The man represented by the fossil remains discovered in the Pampean mud pertains, as it has been said, to the primitive type discovered also in Brazil, but as we advance further north remains of other men appear, and the tupi-guarani type takes the principal place.

Along the littoral of the La Plata estuary it is possible to follow the southerly march of all these prehistoric races by their remains. It is still a mystery who were the ferocious Charruas inhabiting the Atlantic coasts of Uruguay; whether they were of the Guarani stock or the result of a mixture with the primitive type. Some of their stone implements resembled those found in the Rio Negro valley, and their peculiar stone clubs have also been discovered there as well as in the Chubut valley. In the La Plata Museum there are some stone axes and some zooform stones from Uruguay similar to those discovered in the Calchaqui region, but different to those of

the Brazilian tribes. In the delta of the Paraná have been found burial urns of the same shape as those used by many old Guarani tribes of Brazil, while, advancing to the north, the Minuanes remains of the province of Entre Rios show a race which seems to have come in contact with both the Guarani and Charrua type. Probably the Querandis, who, at the time of the Spanish conquest, were settled where to-day is the town of Buenos Aires, were mixed with Guaranis, as they were huntsmen and fishermen. Further north we meet the Misiones tribes, all of Guarani stock, so tractable that they were easily dominated by the Jesuits with satisfactory results. A few Europeans, not purely Spanish, in a few decades reduced these savages to semi-civilized life. I have seen very good copper etchings made by them, and it is presumable that the numerous carvings in stone and wood in the churches were worked, not by the missionaries, but by native artists. To-day only a few ruins of a past comparative magnificence remain; the Indians have returned to their primitive manner of life, and only quite recently civilized man have reached and again commenced to exploit the country, which possesses richness of soil, magnificent forests, splendid rivers, and prodigious waterfalls. There the poor Indians of Guarani extraction fish and hunt without fear of the Europeans; but the wild Guayaquis, who seem to be the remnants of one of the primitive types, wander in the forest in a low state of culture, identical with some of the migratory peoples which I have mentioned before.

I wish to draw attention to the stone axes of these Guayaquis, made of a stone slightly polished, inserted in a branch of a living tree cut down after the growth has compressed the stone. I know of nothing similar to this among other races.

Going to the west, crossing the Parana river, we met the Chaco tribes, who were very numerous during the sixteenth and seventeenth centuries; speaking different languages and dialects to-day, these tribes are reduced to the Chamacocos, the Matacos, Tobas, Mocovis, and Chirihuanos. Putting aside the Chamacocos, whose culture approaches that of the Tupi-Guaranis, the other tribes seem to me of the same stock as the pampean tribes, differing only in habits due to the lapse of time since their appearance in South America and to the surroundings—the treeless pampa poor in water, or the forest region crossed by many streams. The physical type has, however, so many resemblances that the suggestion of a common origin is not without reason.

II.

When the Spaniards came overland from Peru to Chile from the river Plate to the country which is now the centre and north-west of Argentina, they met different peoples who were more cultivated than the tribes of the lowlands in the east. In what is to-day the Cordoba region, and in Tucuman, they met some agricultural tribes; and

penetrating to the mountain region, they were stopped by semi-civilized and warrior peoples, the population being great, and agricultural pursuits and irrigation practised everywhere. In the San Juan and Mendoza region, to the west, they also found large agricultural population. Moreover, the ancient chronicles tell us that in the countries settled by these populations there were ruins and other remains of unknown peoples upon which later discoveries have not thrown much light. In the Argentine region bounded on the east by the Chaco forests, on the north by the salt plains, by the pampas on the south, and on the west by the crest of the Andes, numerous sites are found containing specimens of ancient arts and industries. Argentina thus forms one of the most interesting of fields for anthropological research. Proceeding from the south, we see the ancient settlement of Cordoba and San Juan, where beautiful earthenware, human and animal figures in pottery and stone, stone arrow-heads and axes perfectly polished, are exhumed, and not infrequently human remains—the first sometimes in the same bed and at the same depth as the remains of extinct mammals. In Mendoza I have photographed isolated petrographs, remarkably similar to those found in the south-west of the United States, Mexico, Columbia, Guiana, and in Northern Argentina. Further to the north, proceeding along the mountains, the same petrograph becomes more numerous, and in many points rocky walls are covered with these probably mythico-religious figures. In the neighbourhood of the town of San Juan, I have explored some ancient encampments. In the plain were human remains of the type of the common Tehuelches and Gennakens, while in the mountain valleys the remains were of a more advanced agricultural people, and the anthropological type was also different, approaching the Calchaqui of the north. In the lower valleys, close to the eastern foot of the Andes, I explored some very old places in which several bodies were adorned with Pacific marine shells and with wooden ornaments, containing mosaics of turquoises, evidently extracted from a neighbouring hill. The great South American road called "the Incas road" passes along this valley at the foot of the mountains, to the Uspallata gorge, through which it turns westward to the summit of the Cordillera and crosses to Chile. Stone walls are in every part by the side of this road, and numerous petrographs show that the road was made by the same race who used to carve the stone.

This so-called "Incas road" was, I believe, built before the Incas settled in Peru. Moreover, in the Andean gorges I have seen extensive ruins where to-day life is extremely difficult or impossible during a great part of the year, and extensive irrigation works are to be seen where to-day one could not possibly find a drop of water, showing that the climatic conditions of these regions have changed, and that the waters must have diminished. It is known that a century ago the small lakes of Guanacache, between San Juan and Mendoza, were much

more extensive, and that the Indians navigated them in the same manner as they navigate Lake Titicaca at the present time. In all these regions I have neither seen nor heard of burial urns. If we ascend from the regions of Cordoba to the Andes northward, we arrive by the east at what is to-day Santiago del Estero and the eastern slope of the Aconcaguan ridge. I have pointed out that in the Paraná highlands to the north there were Indians who were accustomed to bury their dead in urns, and when in 1876 I studied some ancient encampments on the banks of the Rio Dulce, close to the town of Santiago del Estero, I discovered with surprise some urns made of a rude material containing bones. Close to these I found an enormous quantity of broken pottery, of workmanship I have never seen before in Argentina, but similar in colour and drawings to some ancient pottery of the Shiwi of North America. From these urns I obtained a well-preserved skull, and another not so well preserved, the first of the deformed type, resembling somewhat those of the Rio Negro in Patagonia, and those of the Calchaqui, Ancon, and Chinnooks of North America, but more exaggerated; the second seemed a normal skull of the mesocephalic type, and inside the urn were some marine shells of the Pacific ocean. One axe in stone of the general Calchaqui type, and some other carved stone, I obtained from a cave in the neighbouring hills, and I was told that these caves were to be found in large numbers, and that all had been inhabited by men. It was near this spot that a Maorian stone club was discovered. Afterwards I discovered that these ancient settlements continued to the north-west, and we have in the La Plata museum very interesting specimens, notably a great burial jar, showing the holes drilled in the bottom, as was the custom amongst the Shiwis of the south-west of the United States. The man buried in it was of a type very different to those of Santiago and Calchaqui, and mixed with the bones I picked up a small piece of lead with an iron handle, the only piece of that kind that I have ever seen. The iron has not been analyzed yet, so I cannot say whether it is of meteoric origin not uncommon in the region. Continuing by the east of the mountains, we arrive at the Salta and Jujuy region. There is the gate from the high plateau of Bolivia and the headquarters of the old Juris, the "taller and darker men" mentioned in the first chronicles. There the remains of ancient inhabitants are more numerous, and their implements and bones show that there was a population composed of Calchaqui, Chirihuano or Tupi-Guarani, Patagonian, the so-called old Aimara, and Peruvians. West of this region is the valley of Guachipas, by which the Calchaqui easily reached the open country; to the north and north-west is the road of Humahuaca, and the Rinconada whence gold ornaments have been obtained. These were the ordinary routes taken by the Spanish during the earlier years of the conquest. It is impossible to say whether the Juris, as the name seems to indicate,

were one of the Patagonian types,—"the Ostriches," which the pampean Indians have hunted so much, because the aboriginal settlements of that part of America are so old; but it may be that the populations who met the Spanish in that corner were the result of a mixture of many races. Doubtless they included the same tupi element met with in the eastern side of the Andes from Columbia to the extreme south.

I will now say a few words on the more interesting general type of the Argentine native population, the Calchaqui, who merit more attention than they have hitherto received from geographers and anthropologists.

The eastern side of the southern prolongation of the Bolivian Andes in the north-west is wooded and well irrigated by nature, and slopes gently to the pampean and Chaco plains; but, crossing the high mountains of the Aconquija range, penetrating by the valley of Guachípas, or to the south by the dry salt plains of the Llanos of San Juan, La Rioja, and Catamarca, the traveller will see regions of very different aspect. A series of parallel ridges, very seldom wooded, sharp, and reaching sometimes 18,000 feet altitude, runs north to south as the termination of the central Andes of Bolivia. To the east is the long valley of "Calchaqui," extending from the Argentine-Bolivian high plateau in 22° S. lat. to the transversal ridge of Capillítas in the centre of the province of Catamarca. To the east of this valley rises the chain of Aconquija, and to the west the snowy border of the Puna of Atacama. The valley is sometimes narrow, sometimes broad, with subsidiary valleys which communicate with the Puna of Atacama on the west, with Salta and Jujuy region on the east, while towards the south it expands into a dry basin in which end other small valleys from the north and west, and to the south-west it narrows into a gorge communicating with the vast ancient lacustrine basin of Catamarca. The Puna plateau highland, the lowest point of which is at an elevation of more than 10,000 feet, is covered to an extent of nearly 60,000 square miles by some low ridges half buried in the ashes and lava of hundreds of volcanoes, several of which reach an altitude of 20,000 feet, and are still active; salt dry lakes, where borax is now being dug, also lie in this region. To the south of the Aconquija knot is the valley of Singuil and Catamarca, which ends in the salt plains of Rioja and Cordoba. To the west the Ambato chain separates from the broad old lacustrine basin called las Salinas of Catamarca, in the north-east corner of which is Andalgala, and in the north-west corner Belen, at the gate of the gorge before mentioned, and Londres, of Catamarca, a very humble village so named by the Spanish conquerors when Philip II. of Spain was husband to Mary Queen of England.

To the west and south-west stretches a mountain ridge, with a projecting spur to the south; the latter is cut by the river of Tinogasta,

and is known as the Sierra de Velasco. At its eastern foot lies the town of La Rioja, and further east the valleys of Vinchina and Tinogasta. The latter extends south-west into the province of San Luis, which is bounded on the west by the high chain culminating in Mount Famatina, which is 20,000 feet in height. The valley of Tinogasta communicates with the western depressions. The narrow gorge of Watungasta across it was the best route in early times to Copiapo, in Chile, and thus in its entrance was a Calchaqui military post. To the west lofty mountains, generally volcanic, reaching an altitude of 22,000 feet, and deep salt depressions render permanent settlements impossible. To the south and west of Famatina chain open the long valleys of Vinchina and other narrow valleys running west, carrying the waters of the whole region southward to the great basin of the river Colorado, which, however, does not reach the Atlantic.

All these lands are arid and volcanic, in great part broken by old erosive action, having a desert appearance similar to the south-west regions of the United States of North America and the north-west parts of Mexico. The vegetation where irrigation has not reached is poor, and the predominant tree in the lower plains is the algarrobo or carob tree. In the highlands volcanic rocks predominate, and the scenery now seems that of a dead world. With their black and grey lavas, ashes, and sharp broken stones, which running water has never smoothed, and strong winds blowing almost continually, these dreary, broken lands are apparently unfit for permanent human settlement; but that has not always been the case. My duties have taken me several times to many of these plains, valleys, gorges, and summits, and in every part I have seen proofs that it was once settled, the climate being then mild and temperate.

I have said that the Calchaqui valley, properly so called, extends from the Argentine-Bolivian high plateau to the south. Northward, where the land reaches an average elevation of 10,000 feet, there are remains of very large settlements once occupied by mixed races of so-called Calchaqui, Aimara, and Peruvians. Calchaqui civilization commences for my purpose in the region to the south of the gap of Acai, which is an elevation of 15,000 feet. In 1893 I visited that region, penetrating to it by the gorge of Belen; I ascended the high plateau of the Puna to Antofagasta de la Sierra, descended to the east to Calchaqui valley, and, following it to the foot of the above-named gap, I came again to the Puna, reached Mount Zapaleri at 22° 15′ S. lat.; then, returning straight to the south, again reached Antofagasta de la Sierra, visited the Calchaqui ruins near the poor village, went westward across the crest of the Cordillera de los Andes, and, turning again to the south-west across that dead region, reached Tinogasta, in the province of Catamarca, along the longitudinal valley. In 1876 I had reached the gorge of Belen, coming from Santiago del Estero, passing

by Catamarca, Pilciao, and Andalgalá; and in 1895, penetrating from la Rioja, I examined the western valleys and the south of the high volcanic plateau, till I reached the place I had arrived at in 1893. I then returned to Tinogasta by the narrow gorge of Watungasta before mentioned, and thus am acquainted with nearly all the Calchaqui region, in which traces of that former American civilization may be seen to-day.

I do not think that the remains which are found in every part of that region all pertain to one race or to one epoch; but, on the contrary, they belong to many epochs and to different peoples representing many centuries of human settlement, the latest peoples being subdued by wild tribes who came from the east and south.

At the eastern foot of the mountains every day specimens of human culture are discovered, sometimes very deep, in the open ground close to the stream. Numerous hollows in the rocks show that long ago corn and algarroba beans were there pounded; burial-grounds are met everywhere, and their contents show not only reverence for the dead and their religious beliefs, but also great skill in pottery. Stone hammers and axes are very common, and animal forms carved in stone, sometimes in hard basalt. In the caves and rocky walls carved and pictured figures, still enigmatic, are preserved, and from time to time great boulders covered with the same are found. These evidences of a cultured and artistic people are more numerous in the valley near the town of Catamarca. The proofs of a large population are observed at once; from the old settlement of Chumbicha at the south end of the valley, to the Pucara at the base of Mount Aconquija, archæological discoveries are daily made, including objects in copper and sometimes in gold. The ruins of towns and villages are still visible, and when the traveller has reached the high hills of Singuil and arrived at the narrow gorge of Pucara, dominated by the extensive ruins of that name, he has passed across a country that once formed a continuous line of villages and busy towns, bordered at the two sides by massive mountains and defended at the extremity by the military posts of Chumbicha and Pucara. Pucara is undoubtedly the largest ancient fortress of Calchaqui, and I think that its purpose was to defend the valley of Catamarca and the western one from the invasions of the peoples of the eastern plains of Tucuman and Santiago, although it was unable to check them, according to old traditions. I have passed some days among these interesting ruins, the walls of which extend for nearly 2 miles, dominating by 1000 feet another valley situated to the north, enclosed by mountains, and where the remains of walls and agricultural grounds show that the population numbered tens of thousands. To-day the waters of the valley are scanty, and used only by a few descendants of the natives, possessing only a few goats and a little maize. In former times rains must have been frequent and water more abundant than it

is to-day, as there are still visible small grounds in the rocky slopes which have been cultivated by natural supplies and not by irrigation, which would have been impossible.

Passing from Pucará to the west across the dry abrupt chain of Ambato, is an extensive old lacustrine basin of 5000 square miles, bounded by mountains on the east, north, and west, and by low hills in the south. I visited the foot of the eastern side, and can say that the small water-supply existing to-day (scarcely sufficient for the needs of the small villages) would have been insufficient for the former large population. Their remains extend in every direction, even to the middle of the old lake, which is reduced to-day to some salt deposits, though flooded during the rainy season. It appears as if the settlements encroached on the lake during the process of evaporation, for in the bottom of this lake, in the middle of the wood of Algarrobos, is found the Ingenios of Pilcias and Constancia, where the rich copper of the mines of the northern mountains is smelted. The workers and woodcutters frequently brought to the establishment specimens of ancient industry, and discovered old settlements and burial-grounds in districts where now it is necessary to carry water for drinking purposes. Only in the north-east corner of this former extensively cultivated basin is any extensive cultivation to-day. In Andalgala the best wine of Argentina is produced, and other choice products. To the west of the lacustrine basin are the ancient settlements which bear to-day the names of Belen and Londres, and to the south-west the not less prosperous Tinogasta, closing the valley of its name.

This old lake received the waters of another basin to the north from the gorge of Belen. I have passed through it many times, and believe that it would be a good investment for an irrigation company to dam the water that passes through the gorge, giving back to the adjacent region its past agricultural activity. Extremely interesting are the small valleys near the northern entrance to the gorge, and there I have made collections which show how mixed were the people who inhabited this part in past times. At Yacutula I discovered in a burial-ground the extreme of the two human types, the most normal dolichocephalic skull and the most normal of the brachycephalic ever seen in Argentina; the first was that of a woman, probably a slave, whose bones were broken probably at the moment of death, and the second was the skull of a man, buried in a painted jar.

In La Puerta I found the most artistic black pottery now in the La Plata Museum, and a beautiful mortar adorned with two lizards. In San Fernando and Corral Quemado I had proof that the bronze implements which are frequent in the Calchaqui graves, were not foreign, but were smelted and cast on the spot; I discovered some casts and the slag from the melting-pot.

Hualfin contains one of the most important ruins in Catamarca; it

was the headquarters of part of the Calchaqui army, and the centre of a great agricultural district. Hualfin has been in that basin what Pucará, on the road between Andalagalá and Tucuman, was—the western fortified gate of the Calchaqui civilization. The slopes of the mountains that enclose the southern basin are rich in ruins of towns and villages. The western slope of the Aconquija is covered with them, and in the central valleys there have been discovered megalithic monuments which seem to have preceded those of Tiahuanaco, on the shores of Titicaca.

In the valley, and in the mountains that close it in to the west, are still more ruins of forts and towns, once agricultural centres. In every gorge, in the mountains, in every small valley at their foot, are seen ruins, and more ruins. I will mention only those of the Cajon ridge to the east and west, where nearly all the abrupt slope is covered with walls and steps, where the natives sowed their crops and protected themselves by numerous military posts and forts. To-day very little water runs at the foot. Famabalasto and Fuerte Quemado are steep ruins, the existence of which implies a much damper climate; so also do the remains of agricultural districts and towns of Santa Maria, Villarica and Jujuy, some in the low plains, others in the top of small tablelands, or "mesas," all of them to-day cut by deep ravines. There we have a scenery which reminds me of what I have seen in the pictures from North-West Mexico and Arizona, and Dr. H. Ten Kate, my travelling companion in 1893, who had visited those regions and the ruins of the ancient civilization of the Shiwi or Zuñis, was astonished at the similarity of the two landscapes, and the same characteristic features may be seen all over the north-west regions of Argentina.

In the neighbourhood of Santa Maria will be found the chief remains of the Calchaquis, and Fuerte Quemado is indeed the most interesting of its ruins; these are situate on the top of a precipitous hill, with steep access by a single narrow passage. The most extensive ruins are those of the ancient town of the Quilmes, a little to the north. Here are the stone walls of thousands of houses, overgrown to-day by cacti and bushes. The museums of La Plata and Buenos Aires have obtained excellent collections of specimens from these ruins. Tradition says that the Quilmes were not Calchaquis, but of Chilian descent, but I have seen no evidence to justify such a tradition. To the north of Quilmes, the traveller continues to meet with ruins at Colalao, Tolombon, Cafayate, Molinos, Payogasta and in every little village, or wherever there was a probability that man could settle.

Copper instruments have become more numerous in that part of the valley, as also in the vicinity of Salta and Jujuy. Calchaqui ruins in the west are found at Antofagasta de la Sierra and at Antofalla. In the valley of Antofagasta de la Sierra to-day there are scarcely fifty inhabitants. Antofalla is deserted; only occasionally an Atacama Indian

is seen there, keeping some goats and llamas, but in the time of the Calchaqui occupation an extensive population was located there. I visited the ruins of Antofagasta, and the photograph that I took gives a good idea of them, as well as of the barren aspect of the land to-day. There are small streams that empty themselves into a little lagoon at the foot of the two recent volcanoes, which spread their lavas in the middle of the lake, now nearly dry. The climate does not allow of any other cultivation, in very small patches, than a sort of clover, which is not indigenous, and which grows in extremely poor conditions. In the time of former settlements there were cornfields and irrigating channels, while among the ruins of the town, and in the black lava, I have discovered foundries and small melting-pots and broken casts for beautiful bronze disks.

In Antofalla one of my assistants made interesting discoveries of a Calchaqui settlement. Passing to the southern and northern region in the western volcanic region and in the valleys, the ruins and the burial-places are common in every part where waters existed in old times. Human settlements have been discovered at a height of 18,000 feet.

III.

All that I have said in this paper shows how interesting is the anthropogeography of Argentina, and how many human problems are connected with the geography of the southern extremity of America.

First, we have the remains of man who lived when the continent had not acquired its present relief and contour; next, this man developing, commenced his migrations, while another man appeared in the regions of the west at the end of the Glacial epoch; and we have seen the old people pushed to the south, where to-day we meet their descendants, and amongst them we note an extraordinary variety of types never observed in any other country of the world. We see man living in caves with extinct mammals, as man lived in European caves of the Pleistocene period, and other people migrating from the northern extremity of the American continent. We find Polynesian anthropological elements mixed with the Patagonians; Polynesian culture amongst Calchaqui and old Peruvian culture. Advancing in time, we find a complicated civilization which is impossible to refer to any known type, yet presenting an astonishing similarity in some respects with that of people who lived in the same latitude in the northern hemisphere, and in a land of similar physical conditions. There is a remarkable analogy between the petrographs extending from Arizona to Patagonia, on both sides of the Andes, and between the industrial arts and myths. In intermediate countries there are identical analogies with races of the south and of the east. In Bolivia the ruins of Tiahuanaco and other similar ruins have no antecedents—the people to which they are referred, the one that used the macrocephalic deformation,

has its representatives from Vancouver to Patagonia. In the old Peruvian pottery the human types are not all those of the natives of to-day, but those of Patagonia, Tierra del Fuego, and Chile—in this same pottery Mexican types appear represented as prisoners. Several small artistic terra-cottas, so common in the old Mexican towns, have been discovered in the pampas of Buenos Aires, while other Mexican objects are the same as some of Calchaqui; Calchaqui remains extend from the Atlantic to the Pacific, and from Patagonia to Peru, and inter-Andean trade existed in those remote epochs, showing the enterprise of the peoples which maintained such relations across so great a barrier. When we remember all these facts, we cannot but believe that man has existed from a very remote period in South America, and that inter-continental and, more, interoceanic communications have been maintained from prehistoric times until the day that the Spanish conquistadores continued the work of the wild tribes in destroying the older prosperity when other civilizations commenced to decay.

Now, who are the Onas, the Tehuelches, the Gennakens, the Araucanians, the Misiones and Chaco tribes, the Calchaquis? It is impossible to answer this to-day. I have indicated the importance of these investigations in the hope that it may conduce to the solution of these problems, but I begin to think that we are already in presence of the elements which formed the old and lost civilization, the ruins of which are spread over the whole continent of South America. The anthropologist, treating of North America only, and ignoring what can be seen in South America, supposes that the latter continent was peopled by the races of the former, and that the ancestors of the Pueblos were also the founders of the old civilizations of Peru and Bolivia, but I think that the South American origins are the older, and that there is ample evidence to support my contention. I remember that the science of palæontology has demonstrated that the pampean mammals migrated from south to Mexico and the United States, and it is not impossible that men may have taken the same northward route. It is true that the mastodon is a European and North American mammal, but it is not to be forgotten that its remains are also abundant in South America, in beds of the same age as that of North America and Europe.

Undoubtedly the study of the geographical conditions of South America during the latter part of the tertiary age and the commencement of the pleistocene period will help very much to the solution of so many interesting problems.

HOW ARE WE TO GET MAPS OF AFRICA?*

By Colonel Sir T. H. HOLDICH, K.C.B., C.B., R.E.

At the meeting of the British Association which was held at Bradford in the year 1900, a committee of the Geographical Section was formed for the consideration of certain general principles which should be adopted in developing the mapping of the African continent, and which would ensure (*inter alia*) that full use should be made of all the geographical material which is gradually being amassed, not only under Government direction, but by independent travellers working in the interests of the Royal Geographical Society.

The resolution which that sub-committee presented at the Glasgow meeting of the British Association this year is as follows:—

The Survey of British Protectorates.—Report of the Committee, consisting of Sir T. H. Holdich (*Chairman*), Colonel G. E. Church, Mr. E. G. Ravenstein, *and* Mr. H. N. Dickson (*Secretary*), *appointed to draw up a Scheme for the Survey of British Protectorates.*

Your Committee are of opinion that a representation should be submitted to His Majesty's Government in support of an organized scheme for surveying British Protectorates in Africa, and that it would be advantageous to secure the co-operation of the Royal Geographical Society, and of other bodies unconnected with Government who may be specially interested in the matter, in bringing forward their proposals. At present, various surveys have been commenced in different parts of Africa under local administrations, which are unconnected with each other and have apparently no common basis of technical system or scale, from which it will be difficult eventually to compile a satisfactory and homogeneous first map of our African possessions. A large amount of geographical work, carried on more or less under the auspices of the Royal Geographical Society, is gradually accumulating, all of which might be usefully turned to account in a general survey scheme, if uniformity of method and scale were adopted. A comprehensive scheme of geographical survey (apart from special surveys for local requirements), to be carried out jointly with other nationalities in the continent of Africa, will undoubtedly prove a necessity in the near future for purposes of boundary demarcation and administration; but such a scheme must emanate from those responsible advisers of Government who are best acquainted with the opportunities for combined action and the means for carrying it out.

But, pending the adoption of such a scheme, and with due appreciation of the value of the disjointed efforts which are now being made to secure partial surveys for administrative purposes in various parts of the country, your Committee are of opinion that the following considerations, none of which involve immediate financial outlay, should be especially brought to the notice of His Majesty's Government; inasmuch as immediate attention to them would undoubtedly tend to hasten the attainment of the end primarily in view—viz. the construction of a homogeneous and consistent geographical map of that part of Africa which affects Imperial interests.

(1) The advantage of a common scale should be impressed on local administrations who have already commenced surveys within the protectorates under their

* Map, p. 656.

administration, and every effort should be made in the first instance to secure a general map on the smallest geographical scale which can be made practically useful for purposes of either administration or strategy. This scale should not be less than one in five hundred thousand.

(2) Inasmuch as all future surveys, on whatsoever scale, must ultimately depend on the accuracy of the initial base measurements if they are to fit together into one homogeneous map, it is most desirable to draw the attention of local administrators to this point; and, wherever local surveys have already been commenced, to test the accuracy of their linear measurements by the adoption of a geodetic base. Such a base need not be measured by the cumbersome processes which have made the measurement of geodetic bases so laborious and expensive in the past. New methods and improved means have lately been introduced which greatly simplify the work, but there is no method which does not require scientific direction. It would, therefore, be advisable that the same instruments, under the same personal supervision, should be used in every case. Unity of scale and of linear measurement is absolutely essential to final compilation in such vast areas as Africa presents, and much good work now in progress may be rendered valueless for general map-making purposes if such unity is not secured *ab initio.*

(3) It is the earnest desire of the Royal Geographical Society that those travellers and explorers who use their instruments and accept their assistance financially should add to the practical outcome of mapping material in Africa. For this purpose the Society has established training classes in practical geography, and keeps a record of the names of those who are qualified to work as geographical surveyors. But in order to utilize their work to the fullest extent, it is essential that the geographical data determined by such professional surveyors as from time to time are sent to Africa under the direction of the Intelligence Department should become generally available; and it is therefore most desirable that all such material (indispensable for the proper location of field surveys and for check on final positions) as may be collated at the Intelligence Office may be placed at the disposal of the Royal Geographical Society. Attention should very specially be drawn to the great amount of geographical mapping (at present disconnected and wanting in topographical detail) which is annually turned out by irresponsible travellers. The value of this might be largely increased if it were based on exact data.

(4) One of the most important factors in dealing with the vast area of our African possessions in the matter of geographical (or first) surveys is the absolute necessity of resorting to native agency for its topography. Effective topography can never be secured without the assistance of surveyors and draughtsmen specially trained to this particular branch of map-making. European agency (except for purposes of supervision) is out of the question on account of the expense. Indian native agency is equally impossible for more than comparatively restricted areas. The vast mass of African mapping must be secured through the agency of natives of Africa, just as Asia has largely been mapped by Asiatics.

There is apparently no reason why natives of Africa, trained in mission and other schools, should not be as effective in the field of survey as Africans generally have proved in the field of arms.

It is suggested that in the earlier stages of the formation of such an agency scientific societies might be willing to take the initiative. It is to the interest of the Royal Geographical Society, for instance, to secure the assistance of native topographers for explorers. What is immediately wanted is the initiation of a training school; and it seems probable that, if one or two promising pupils were selected from each protectorate for training, an invaluable school would in a few

years be established, which would rapidly extend of itself. The Commissioners and Administrators of our African Protectorates might be requested to assist in the experiment by ascertaining whether volunteers from the native schools can be found for the purpose. Every assistance to such a scheme may be confidently anticipated from the Indian Government, who have long had practical experience of the enormous advantages of native labour in the field of surveying.

This resolution will in due course be submitted by the British Association to those Government offices, societies, and administrative centres, both at home and abroad, which are concerned in the survey of Africa. Meanwhile a few words in the R.G.S. journal, explaining in rather fuller detail the object of the proposals embodied, and the manner in which the Royal Geographical Society may be able to further those objects, may be useful.

We have, first of all, to recognize the fact that the field of geographical enterprise presented by the *terra incognita* of Africa is growing exceedingly narrow. There are no more sources of mighty rivers to be traced out; no more "Mountains of the Moon" to be set on a geographical basis; no more big lakes to be dubbed by royal names; and no more regions of outer darkness to illumine. We have arrived at a day of comparatively small things, a prosaic day of patient local enterprise, of regulation Government surveys, and of contracted geographical exploits under Government direction. And just in proportion as we have a narrower area to work in, we require more solidly accurate and scientific geography to fill those areas. In short, the geographical work of the future, whether under Government supervision, or in the hands of the more or less irresponsible explorer, should possess those technical qualities of accuracy, breadth, and style which will entitle it to take its place in the finished first map of the continent. Such work may appear to be rather beyond the attainment of the average traveller; and it might even appear desirable that the Royal Geographical Society should rest content with the magnificent achievements of the past, and leave that which is still uncertain in the physiography of Africa to the surer, more accurate, more scientific, and infinitely slower processes of Government professional survey. But we have had instances enough lately to prove that accurate and scientific geography is not at all beyond the reach of the ordinary educated traveller, provided he has proper means and assistance at his command; and we have only to examine carefully the new map of Africa,* and measure up those areas which have yet to be mapped, to realize that its requirements are still so enormous that if we wait for the slow tide of regulation surveys to cover the unfilled spaces of the continent, we may wait a very long time indeed. Referring only to those districts of Africa which are more or less directly under the British protectorate in the Sudan, East Africa, Central Africa, South Africa, and West Africa,

* See Mr. E. G. Ravenstein's map, appended.

we find that there cannot be much less than 2½ millions of square miles of territory which require accurate geographical mapping for military and administrative purposes. This, of course, implies that we do not trouble ourselves about districts under the protection of other European powers than that of England, only confining our attention to territories about which it is absolutely essential that we should possess accurate information. It is difficult to compare this mass of prospective mapping with any results achieved elsewhere under conditions sufficiently similar to justify the recommendation of definite methods in order to attain similar results. Probably the general physiography of Africa, and its conditions of life (regarded from the surveyor's point of view) more nearly approach those of Asia than they do those of Europe or America. It is true that in Asia our direct national interests do not extend anything like as far. All the peninsula of India, including the Native States and Burma, with the Himalaya on the north, hardly cover a million and a half square miles. If, however, we include the trans-borderland of the west, and the trans-Himalayan plateau or highland country (all of which is directly related to India, and has already fallen within reach of exploratory survey), we shall more nearly approach the weight and value of that huge geographical enterprise which lies before us in Africa, and we may find ourselves finally justified in drawing on our Asiatic experiences for certain general deductions to guide us in tackling the great African problem. It is idle to make comparisons between the physical conditions of Asiatic and African geography; equally idle to balance the idiosyncrasies of the Asiatic races against those of Africa, considering the enormous area of infinitely varied physical aspect and the wide diversities of race and nationality which distinguish both continents. Special methods to meet special conditions will be requisite in Africa just as they have been needful in Asia. It is only possible to indicate the general character of those methods of map-making which are likely to be just as applicable to the greater part of the African continent as they have proved to be in Asia. One thing at least is clear, *i.e.* that every factor that can be utilized to multiply the great sum of geographical map making in Africa should be utilized to the very utmost.

The first, and perhaps the chief, of these factors is to be found in those Government surveys which have already been initiated in many parts of the continent, and which are to be carried out under a recognized system of technical detail which will ensure a high standard of accuracy in the field and of final expression in the shape of maps. With this organized system—or rather with those many units of it which at present appear to be independent of each other and of any central control—the Royal Geographical Society has little to do. It involves, in the first instance, an elaborate programme for a "geodetic arc" which is to extend from "the Cape to Cairo," the triangulation

of which is to be carried out with all the rigorous attention to minute accuracy that the science of geodesy demands. This scheme of initial triangulation is to serve two purposes. It is, in the first place, to assist in the final determination of the exact figure of the Earth—a purely scientific purpose of the highest interest to mathematicians, but one which is never likely to have much practical effect in revising the world's mapping. This is strictly the "geodetic" aspect of it. But it should also serve the purpose of a great continental backbone to a general system of triangulation extending therefrom into all parts of Africa. In itself it will only cover a narrow width of country somewhere about the meridian of 30° E. long., but it will furnish the basis throughout its length of points exactly determined from which other triangulation of a more or less rigidly accurate nature may spring. From this point of view it is a practical necessity. No country in the world that professes to illustrate its physiography with maps of scientific accuracy has ever been able to neglect it. The want of it, even in comparatively restricted areas, has only landed the governments concerned in uncertainty and confusion, which have led to delay and expense in all forms of economic development. From these other less rigid systems of triangulation which spring from the geodetic arc there will spring again yet minor systems, until the whole country is covered with a network of points; and finally the topographer will be introduced to complete the mapping. This is the ordinary process of survey evolution where accurate and satisfactory mapping on varied scales is necessary for economic purposes; and it need hardly be added that it will be just as necessary in Africa as it has been found to be elsewhere. But all this systematic and regular process of survey must be initiated and directed by Government, and it will necessarily be a slow and tedious process. Money must be raised for it, and a trained staff of officers and assistants organized to carry it out. It will take some years to train a really efficient staff of topographers alone; and if we are to judge by the average rate of progress maintained in the past, when systematic surveying of this nature has been adopted, we could not reasonably expect to possess even a first map of all our African protectorates on a scale sufficiently large for military or administrative purposes within the next half-century at soonest. But whilst all experts are prepared to maintain that the primary basis and support of a well-constructed survey, covering such a vast area as is presented by our African protectorates, must be triangulation of a nature which can claim to be called geodetic in the strictest scientific sense of the term, they do not all of them advocate the principle of waiting for the first mapping of these important states until that geodetic basis is complete. It would be well, no doubt, if so satisfactory a bed rock for all subsequent operations could be secured, but the demand for maps of such a class as will serve the purposes of administration, of public works, or

of military movement is far too urgent to permit of the delay that must be involved in preparing it. Accurate *geographical* maps are the great necessity of the present, and there is not an administrator in Africa who is not crying out for them and doing his best to get them. Thus it happens that there is a vast amount of mapping already in progress—some of it under Government direction, and some of it colonial—which (good or bad) will form another factor in the final sum of African map-making. All of it is equally independent of that geodetic basis which has been claimed as the *sine quâ non* of a continental survey, and the question arises whether all this material can be finally pieced together and fitted into the complete map product without confusion and difficulty when the time comes for the inevitable compilation.

This depends on what other system of triangulation, or what substitute for triangulation, has been made use of in the absence of the strictly geodetic class; it also depends, to a certain extent, on the adoption of unity of scale and of linear measurement throughout the varied areas of survey. It is to these important points that the resolution of the British Association was designed to draw the attention of those administrative authorities under whom scattered surveys in British protectorates are now being pushed forward; and there is reason to hope that administrative authorities of foreign territories adjoining those of England will also recognize the advantage of these proposals, tending to the attainment of a scientifically accurate map of Africa as a whole. But the colonial surveys, which are already far advanced, have not recognized these principles. Strange as it may seem, although South Africa (*i.e.* Cape Colony and Natal) has for some years been traversed by a magnificent system of geodetic triangulation of the very highest value (the only true *geodetic* triangulation in Africa), none of the colonial surveys have been either based on it or adjusted to it. At present it stands alone as an abstract scientific enterprise, with no practical or utilitarian outcome whatever. And the result is that when the great accumulation of colonial estate maps were patched together in order to compile a practical military map, it was found that (possessing no general basis of triangulation) there were internal discrepancies which absolutely invalidated the map for military purposes. Such a combined patchwork of local surveys is of little or no value as a general map of the country even for ordinary civil and administrative purposes. For instance, it would be unadvisable to depend on it for the allignment of a railway or a boundary. Very considerable expense and delay must be incurred before a really satisfactory map (even on a small scale) could be constructed out of such material. The Government surveys in the protectorates, in the Transvaal, and in Egypt (equally independent of a geodetic basis) are conducted on the more or less regular lines of preliminary triangulation and subsequent topography, and they should not only be effective first maps of the

country they represent locally, but they should be readily adjustable (without appreciable error) to the final framework which is to give each local series its true geographical position as soon as that framework is ready. These surveys would be officially classed as topographical, but the map results must often approximate to that which we now define as "geographical" when no rigid rule of technical procedure can be followed. Triangulation may sometimes be an impossibility (as it usually is in West Africa), in which case elaborate topography is out of place, detail is scanty, and the process of surveying becomes a process of exploration with a small-scale map as the result. Such work can only rank as geographical surveying, and it may be pretty safely assumed that very large areas indeed of the African continent are suited to this form of work only. But geographical survey should be by no means limited to those areas which are unsuited to a more elaborate system. On the contrary, it would be well if geographical survey were to precede all other forms of survey everywhere. For a vast proportion of the continent of Africa (as of Asia) it will inevitably be found that nothing better will ever be needed; and even for that which is destined hereafter to develop under British rule into a full measure of civilized prosperity, the process of development will be greatly accelerated by the assistance of a good general geographical knowledge of the country beforehand. There is no necessity to enter into details of what constitutes geographical surveying. A most excellent book on surveying has recently been published in America, wherein "Exploratory" and "Geographic" surveys are treated for the first time as distinct branches of the general art of topography.* The main points to note are, (1) that geographical surveying depends as much on sound triangulation (or its equivalent), and demands as much attention to accuracy, as any other form of survey; (2) that it can be made to fit with certainty into its right position (as co-ordinated in latitude and longitude) whenever that position is determined by geodetic measurement; (3) that it is exceedingly rapid in its development and comparatively cheap. All those surveys in Africa which have been carried out for boundary purposes, as well as those military surveys which, under Major Jackson, Captain Close, and Mr. Casgrain, have already spread over a great part of the Transvaal, rank as geographical surveys in so far as they have been conducted for the production of maps on a small scale for illustration of the features of the country as a whole, and not for purposes of local defence, etc. Hundreds of thousands of square miles of territory on the Indian borderland have been surveyed on geographical scales by methods which, whilst they follow

* 'Topographic Surveying, including Geographic, Exploratory, and Military Surveying.' By H. M. Wilson. John Wiley & Sons, New York, and Chapman & Hall, London. See also list of works bearing on the subject of geographical surveying at the end of this article.

the recognized system for topographical surveying which is common to all countries so far as is practicable, do not pretend to adhere to any rigid form of procedure where the recognized systems are impracticable. In days that have hardly yet passed by, opportunities which are now utilized for a geographical survey would have resulted in a thin line of traverse flanked by wide blank spaces where no feature was delineated, although much of the physiography of the country must have been within easy range of vision. The difference between these efforts on the part of early explorers and the infinitely more comprehensive illustration of the topography of a country which is now demanded, is due partly to the immense improvement in the graduation of the smaller classes of instruments, but chiefly it is undoubtedly due to the thorough knowledge which is now acquired of the capabilities of the plane-table by well-trained topographers. Instead of the thin red line of traverse, we demand square maps showing every topographical detail which is appreciable on the scale of survey; and we further demand that hundreds of square miles of mapping should be turned out where ten sufficed before; and that all of it should be so fitted within certain well-fixed points that we can determine with certainty the co-ordinate position in latitude and longitude of every feature of the map to a degree of exactness that betrays no error on the small scale of the mapping, when the mapping is tested by the rigorous methods of final geodetic, or first-class, triangulation. This is what we call geographical surveying, and it is a class of surveying which is but half appreciated in England, because in England there is no opportunity for its practice or illustration. It is, however, well understood in America, Russia, Germany, and France, and it has been invaluable to India. Geographical surveying should specially appeal to the members of the Royal Geographical Society, for it places an agency within the reach of every member of the Society which may result in most useful additions to the sum of our geographical knowledge, not only in Africa, but wherever that knowledge is weak. So far as Government surveys are concerned, the R.G.S. can hardly offer any assistance which promises to be practically useful. It can at most but represent the opinion of an influential body of geographers in favour of any method which will ensure unity of scale and homogeneity in the final map-results. But in the broad realm of geographical exploration there is ample room—room, indeed, so ample that it seems hopeless to expect that it will be adequately filled for many years to come—for those expeditions, conducted either in commercial interests or for the simple sake of adventure, which, extending far beyond the region of settled administration and regulation survey processes, might result in the acquisition of geographical map information quite good enough to take its place in line with the permanent map records of Government. It has been so in Asia, and it may be so in Africa. If every independent

explorer would work intelligently on certain fixed methods, there would gradually be amassed so great a store of information of permanent geographical value that we should soon be in a position to deal with topographical certainties in arranging boundary demarcations or in projecting the general economic developments of the country.

I have already said that the fundamental support of good geographical work is a thorough knowledge of the capabilities of that most useful instrument the plane-table. I may now add that, in order to obtain that thorough knowledge, years of experience, united to a special talent and unusual powers of observation, are necessary. The process of the evolution of a firstrate topographer is a process of selection in the first instance, and of careful training afterwards. It is not a course of training for a few months at a military or geographical school that will result in the acquisition of the trained hand and eye of the artist, united to that topographical instinct which teaches a man to identify the features of a varied landscape from every point of view, even when we have secured the physique, the powers of adaptation to unequal circumstances, the endurance, the patience, the tact, and the indomitable perseverance which distinguish the best topographers. Technical training must be allied to practical experience, and it would be as absurd to expect a man to be a good topographer because he knows the theoretical use of the plane-table, as that he should become a good shot because he knows the use of a gun. Yet, judging from the composition of some of the survey parties at work in Africa, this is exactly what is expected. Obviously, therefore, we cannot ask the promoter and organizer of an expedition—the man who has to bear the weight and responsibility of leadership, who has his time most fully occupied in arranging details of the daily march, and his mind full of many other important interests than those which concern the geography of his surroundings—to undertake such an all-absorbing and (at times) perplexing duty as that which is involved in the actual mapping of the scene of action. The most we can ask is that he should supply himself with all the necessary data at starting on which to base his work, and that he should know enough about surveying to carry out the preliminary triangulation, and make the necessary astronomical observations; that he should, in short, be sufficiently well trained himself to keep a trained topographer straight, checking his work, and supplying him with points to work upon—and this indeed is a good deal to ask. It is by the association of a *trained professional* topographer with exploratory expeditions in Tibet, in China, on the Burmese frontier, and in Persia that we have acquired the best part of our map knowledge of those countries. It is a knowledge which will doubtless in time be superseded by more regular and systematic surveys than those which have hitherto been possible over those areas which promise to repay closer examination, but over other

and far larger spaces it is probable all that will be practically wanted for many decades to come. It is, at any rate, sufficient to indicate in what directions such closer examination is desirable, and consequently it is of infinite practical value. But for Africa, where are we to get the trained topographers who must eventually furnish the grit and backbone of African mapping as they have furnished it in India and beyond the borders of India? There is no topographical staff in England as there is in Russia or America or India, and there is no opportunity within the restricted area of Great Britain for the training of such a staff. How are we to get the men we want? It is true that very great advance has been made in late years towards the training of officers. There is a most excellent school at the Royal Engineers' headquarters at Chatham (organized and superintended by Major MacDonnell), which has at any rate led to a far wider and more comprehensive grasp of the whole subject of military map-making by our military authorities than ever existed before; and there is a training class connected with the Royal Geographical Society which has been working towards the same end for years. But it cannot be too often repeated that the limited and restricted practical instruction which is all that is possible in England can *never* turn out topographers such as may be found in numbers in the field of geological survey in Canada or the United States, or on the borders of Russia (wherever she extends those borders), or on the wide extended frontiers of India from Persia to Burma. Neither can Africa draw on India to any great extent for assistance. The requirements of India are sufficient to occupy her whole staff, even if financially it were possible to burden India with the cost of training men for foreign service. It is, moreover, doubtful how far the native of India would be successful in dealing with the native of Africa. Much of the success of the Indian system is due to the practice of training natives of all nationalities for the special object of working within the limits of their own countries. So far as Indian natives have been employed in Africa, the experiment has been distinctly successful, and the record of their work on the part of administrators has been invariably favourable. But they have not been utilized much for purposes of exploration, and it is on this capacity that their assistance now is so urgently needed. The most that can be expected from India is the advantage of the Indian training school for purposes of instruction. In this direction (and in one other which will be noted presently) it is possible that India may extend a helping hand to Africa to some practical purpose.

There are two distinct classes of topographers needed in Africa, viz. European and native, and it must, I think, be recognized as a necessity that the practical training-ground for both should be Africa itself. Already the Transvaal and the Orange River colony have afforded our military surveyors the opportunity for, at least, a partial training in

topography of a section of Royal Engineers drafted out to South Africa for that purpose. The work that has been done for military purposes is, for the most part, of that nature which we now class as geographical, and it will furnish a very fair sample of what may be expected from such an agency in future. If successful, it is much to be hoped that here is the foundation of a trained corps of military topographers who will hereafter be fully as usefully employed in times of peace as in times of war. The process of training has, at any rate, been in most capable hands. The experiment must result in really trustworthy indications. There are, again, a number of men already employed in African fields who have been trained in various schools (some of them hold the R.G.S. diploma), none of whom could possibly rank originally as trained topographers, but amongst whom there must be some who have gradually, by force of circumstances, acquired a considerable practical knowledge of the art. And there is yet again another source of supply which is not as fully known as it should be. The Government of India has decided that after the age of fifty-five no man is to be officially considered capable of undertaking further civil work which is not of an administrative character; so that year by year a certain number of men are dismissed from the Indian Survey Department, on pensions, who are not only capable, but most willing, to take the field for another five or ten years. Amongst them are some of the most experienced surveyors and best instructors that India has produced, and none could be more technically efficient than they to undertake the superintendence of African surveys and the training of topographers, provided that they can (at their age) fit themselves to the new field and the requirements of African administration. Here the Royal Geographical Society may usefully extend a helping hand. It is proposed to keep a register of the names of all such men at the Society's office (along with a general record of the names of all men whom the Society can confidently recommend in connection with their own school), and to circulate that register from time to time amongst those offices which have to do with the organization of surveys in Africa or elsewhere in the colonies. That is to say, that the Society may undertake to introduce the "supply" to the "demand," but will of course go no further than the introduction.

On the whole the prospect of gradually raising an efficient staff of European workmen in the field of topography appears to be by no means a hopeless one. But for one European who takes the field in India, there are at least four or five natives. Economy, no less than efficiency, makes it a *sine quâ non* that most of the exploring work in trans-border countries should be carried out by natives of the country; in fact, India could never do without them. No solid reason has ever yet been adduced against a similar employment of trained natives in Africa. It will certainly take some years before any experiment in this direction can be satisfactorily concluded, because it will take time in

the first instance to select likely pupils (although the sources from which they may be drawn are as infinitely varied in Africa as they are in Asia), and still more time to train them; but the broad assertion that there are no natives of Africa who will exhibit the same peculiar aptitude for geographical map-making which is so marked a feature in natives of all castes and nationalities in India, is hardly to be accepted until the experiment is tried.* But it must be remembered that the experiment, to be satisfactory, must be on a considerable scale and thoroughly complete. It is not every native of India who possesses the idiosyncracies of an explorer, and a special aptitude for topography. On the contrary, the process of selection is one demanding infinite resources of time and patience. One great success is assuredly balanced by at least twenty failures; but then, the one success is well worth all the time and patience bestowed on those twenty failures. We can but hope that the settlement of South Africa will lead to a full and careful consideration of the best means to procure that great desideratum — a thoroughly accurate and homogeneous geographical map of all our African possessions; and that the training of a staff of native topographers will be admitted as one of the means to the end in view. Whether they are trained in a central topographical school analogous to that at Dehra in India, which is, I understand, already contemplated; or whether the experiment is made by the formation of a topographical party for the special object of geographical exploration, seems to be a matter of detail of no great importance. Both methods have been found to work efficiently. What is wanted eventually (say in four or five years' time) is a capable and extensive staff of topographers for Africa, both European and native, on which explorers, whether they are Government officials or bound on private enterprise, may indent (as they indent in India) for that assistance in the technical details of map-making which it is quite impossible that any but a fully trained topographer can give. With that assistance every geographical society in Great Britain could lend a useful hand towards the evolution of the map of Africa.

LIST OF PUBLICATIONS BEARING ON GEOGRAPHICAL SURVEYING.

'Handbook of Professional Instructions for the Topographical Branch Survey of India Department.' Prepared by Lieut.-Col. St. G. C. Gore, R.E. Published in Calcutta.

'Aid to Survey Practice.' By L. D'A. Jackson, A.M.I.C.E. London, 1889.

R.G.S. 'Hints to Travellers.' Woodthorpe's article on plane-tabling.

Professional Papers Royal Engineers (Occasional Paper Series), vol. xiii. paper v. by Holdich; vol. xiv. paper ii. by Talbot; vol. xxvi. paper i. by MacDonnell. R.E. Institute, Chatham.

* To a certain extent it has already been tried. A large area of most useful geographical mapping in West Africa has been contributed to geography by a native of Africa—Mr. Fergusson.

LHASA.

By Colonel Sir T. H. HOLDICH, K.C.I.E., C.B.

Two very interesting photographs have been added to the collection of the Royal Geographical Society, illustrating the city of Lhasa and Potala, the residence of the Dalai Lama, in its immediate neighbourhood. These photographs derive additional interest from the fact that in the October number of *La Géographie* (the journal of the Paris Geographical Society) is to be found the reproduction of a photograph of Potala taken during the present year by a Russian subject—a Kalmuk chief named Ovché Novzounof—which is said to be the first photograph ever taken of the holy city. The date of the photographs herewith published (p. 607) is not precisely known, but there is good reason to believe that it was considerably anterior to that of the Kalmuk traveller. The point of view of Potala is almost identical in both cases, and nearly coincides with that of the early picture of "Bietala," made by the Jesuit fathers about the year 1660 (p. 605), which has hitherto been the only pictorial record of the place.

Potala is the most important architectural feature about Lhasa, and it is described by every traveller who has visited it during the nineteenth century. Manning was there in disguise in 1811; and the French missionaries, Huc and Gabet, resided several months in Lhasa in 1846. Since then no European has set his foot within the gates of the city, but many native travellers have been there, and have brought back records which are sufficient to give us a fairly clear idea of the city and its environment. An Indian Survey explorer, Pundit Nain Sing, made two journeys to Lhasa in 1866 and 1873; and he was followed by a second explorer (A. K., or Krishna) in 1879–80. A member of the Indian Educational Department, Chandra Das, accompanied by a survey explorer, the lama Ugyen, travelled to Lhasa in 1881–82, and to him we owe the most comprehensive and detailed accounts of the city and its people that have yet been produced. In all important particulars they support the earlier records of Nain Sing and Krishna. The latter made a map of Lhasa, which is reproduced from the *Petermanns Mitteilungen* (1885) in the October number of *La Géographie*. These Indian explorers have been succeeded more recently by Russian subjects, Kalmaks and Buddhist priests, amongst whom one Baza-Bakchi is quoted as an authority in the French journal.

According to Baza-Bakchi, the hill on which the Potala palace and temple stand is 500 metres in height above the plain. This is obviously impossible, for (on the evidence of the photograph) it would make the walls of the building nearly 200 metres (over 700 feet) in height. Krishna's estimate of 300 feet is probably much more nearly correct;

and even that gives an impressive idea of the stupendous nature of the construction which crowns the hill. It is difficult to reconcile the earlier Jesuit drawing of the temple and hill with the modern photograph. It

would almost appear that the buildings had undergone considerable extension during the two and a half centuries which have elapsed between the illustrations. It is probable enough that this has been the case; but too much reliance on the details of the architectural drawing

is hardly warranted by the accessories of the picture, amongst which we find a two-wheeled conveyance of the nature of the Indian ekka drawn by a pair of horses !

According to Chandra Das, who entered Potala by the eastern gate-

PLAN OF THE CITY OF LHASA.

way on his visit to the Dalai Lama, he first "walked through a long hall, on either side of which were rows of prayer-wheels, which every passer-by put in motion. Then ascending three long lines of stone steps, we . . . proceeded towards the palace. . . . We had to climb up five ladders before we reached the ground-floor of Phodang marpo, or

'the Red Palace,' thus called from the exterior walls being of a dark red colour. Then we had half a dozen more ladders to climb up, and we found ourselves at the top of Potala (there are nine storeys to this building), where we saw a number of monks awaiting an audience." Nine storeys of, say, 20 feet would account for 180 feet of altitude within the building itself, which obviously extends above the hill as well as down its upper slopes, so that an estimate of 300 feet for the

POTALA, THE PALACE OF THE GRAND LAMA.
(*From Kircher's "China,"* 1667.)

actual height of the hill seems to be fairly well supported by the photographs.

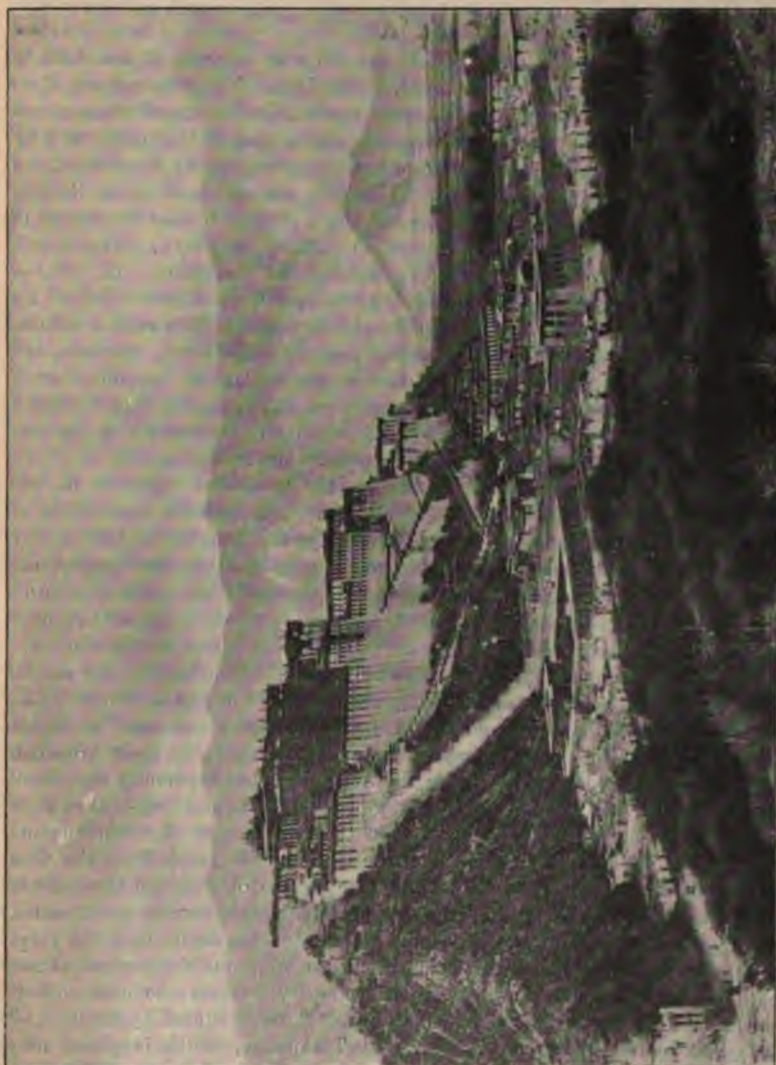
Potala derives its chief interest from the fact that it is the residence of the head of all the great Budhist hierarchy, the Dalai (or Tale) lama, who is represented in the flesh by a child of tender years. In 1811 Manning describes the Grand Lama as a well-educated, princely child about seven years old. In 1846 Huc says that the Dalai Lama was nine years of age, and had been Grand Lama for only six years. In 1866 Nain Sing describes him as a fair and handsome boy of thirteen years of age, entirely dominated by the Gyalpo or temporal ruler of Lhasa. Thus one re-incarnation at least must have taken place between

the visits of these two later travellers, and probably more than one, for, as Montgomerie shrewdly observes, "Grand Lamas are made to go through their transmigrations very rapidly, the intervals being probably in inverse proportion to the amount of trouble they give to the Gyalpo." Chandra Das (our latest authority) writes of the Dalai lama as "a child of eight with a bright and fair complexion and rosy cheeks. His eyes are large and penetrating, the shape of his face remarkably Aryan, though somewhat marred by the obliquity of his eyes. The thinness of his person was probably due to the fatigue of court ceremonies and to the religious duties and ascetic observances of his estate. A yellow mitre covered his head, and its pendant lappels hid his ears; a yellow mantle draped his person, and he sat cross-legged with joined palms." Certain it is that the Dalai lamas of Tibet are invariably children, and that they die as those die "whom the gods love."

The plan on p. 604 appears to be taken from a drawing of the city of Lhasa by a native artist; and there is some appearance of the drawing itself having been made from a photograph as the original. It is not very easy to locate the point of view. The only indication which can be followed is the stream, or canal, which winds through the picture, touching the city walls at two points. According to Krishna's plan, such a feature can only be observed from a point (evidently elevated) north of the eastern end of the city, so that the observer is looking towards the valley of Kyichu, and to the roads leading southwards through the mountains towards India.

If this is so, then the building with the dark-red walls in the centre of the city is evidently the Jo (Nain Sing) or Jo Khang (Chandra Das), the great temple of Jo-vo, or "the Lord Budha," whose famous image, known as the Jo-vo-rinpoche, is said to have been made in Magadha during the lifetime of the great teacher. Here men, women, and children congregate to do worship and to obtain a blessing on June 1, reckoned to be the holiest day in the year as the date of Budha's nirvana. An interesting legend connected with this image is told by Chandra Das in his 'Journey to Lhasa and Central Tibet.' The picture well illustrates the nature of Tibetan homes—"tower-like whitewashed houses and Chinese buildings with roofs of blue tiles" all stone-built and substantial, with a central courtyard. The windows are seldom glazed, paper usually taking the place of glass. A decorative feature of Lhasa is found in the festoons of inscribed and painted rags which are hung from one building to another, and in the banners which line the approaches to some of the principal temples. They may be seen in the Potala photograph, where their motion as they sway with the wind rather mars the effect of the picture. It is hardly necessary to point out that the flag-poles in the native artist's picture are enormously exaggerated in length. About the size of the city (which

is oval in shape, with the longer axis from east to west), there is little apparent difference of opinion. It is 6 or 7 miles in circumference,



POTALA, THE PALACE OF THE GRAND LAMA.
(*From a photograph by a member of the Nepal Embassy to Peking.*)

and contains a population variously estimated from 25,000 to 50,000 souls.

REVIEWS.

ASIA.

Mr. Lynch's 'Armenia.' *

In two large well-printed volumes, Mr. Lynch gives an account of his visits to Russian and Turkish Armenia in 1893–94, and in 1898. The volumes are illustrated by 197 excellent reproductions, some apparently French, of the author's sketches and photographs; by special maps and plans, made in Germany; and by a general map of Armenia and the adjacent country, compiled by Mr. Shawe, and published also separately by Stanford. The first volume deals with Russian Armenia, and contains a minute and, here and there, slightly tedious description of the route followed from Batum on the coast to Kutais, Akhaltsyk, Alexandropol, Erivan, Ararat—which was successfully climbed on September 19, 1893—Edgmiatsin, Ani, Kars, Kagyzman, and the Turkish frontier; accompanied by geographical, historical, statistical, and political information. The second volume carries on the route from the Turkish frontier to Van, Bitlis, Mush, Erzerum, and Trebizond; and gives the details of the second tour in Turkish Armenia, during which much good topographical and geological work was done. In each volume a chapter is specially devoted to geography, and another to statistics and politics; and in the second there is a very useful bibliography and an index.

Mr. Lynch followed no untravelled routes, but in several instances he has added to our knowledge of the districts which he visited; and his descriptions of Akhlat, Nimrud Dagh, Sipan Dagh, and Bingöl Dagh, illustrated as they are by maps compiled from his own surveys and reproductions of his photographs, are both interesting and valuable. It is the first time that the great crater of Nimrud Dagh, nearly 5 miles in diameter and 14½ miles in circumference, has been thoroughly examined and described, and all that is said of it is of special interest.

The volumes give much information with regard to the condition of the people, and to the vast tracts of fertile land which lie uncultivated on the Armenian tablelands. Mr. Lynch finds little to admire in the methods of government in Russia and Turkey, or in the policy adopted by those states towards their Armenian subjects. He writes enthusiastically of the Armenians, but apparently regards all Kurds, whether of Kurdish or Armenian origin, as parasites and long-beaked birds of prey. This is not the place to dwell upon the rival merits of Armenians and Kurds, or upon the fascinating history of the land and its people from the time when Tiglath Pileser I. defeated the confederate princes of Nairi on the plain of Melazkert to the present day. To that history Mr. Lynch scarcely does justice. He has given a good account of the Vannic empire, and has dealt with the kings of Ani; but a more continuous history is needed to bring out the various causes which have led to the present condition of the country. It may be observed that the mediæval kingdom of Lesser Armenia was not "overwhelmed by the Turks" (i. 367), but by the Sultan of Egypt; that Tsamentav, which is placed near Amasia (p. 364), and in the Cilician Taurus (p. 395), has been identified with Azizieh, on the Zamanti Su, eastward of Kaisarieh; and that the great battle in which the Seljuk Sultan of Rum defeated the Kharezmians was fought near Erzingan, and not at Akhlat (ii. 296). In writing of Lake Van, it is remarked that "the most obvious explanation of this gradual rise in the norm of the lake-level is furnished by a cause which must be constantly operative, namely, the increase of sediment deposited upon the bottom" (ii. 52). The rise due to this

* 'Armenia: Travels and Studies.' By H. F. B. Lynch. 2 vols. Longmans, 1901.

cause must be extremely slow, and it would be safer to attribute the fluctuations of level to alternate periods of excess or deficiency in the snow- and rain-falls.

Mr. Lynch's book is full of information, but from a geographical point of view, it is somewhat disappointing. In the descriptions of scenery there is occasionally such a flow of words that the reader is apt to be wearied and lose the impression which the writer intends to convey. And in the two chapters specially devoted to geography, which are based on the researches and theories of Abich, Naumann, Suess, and the author, close reading is sometimes required to grasp the meaning. The series of really beautiful photographs, illustrative of the scenery, the monuments, and the people, which are reproduced with much artistic taste and technical skill, are valuable additions to a work which is something more than a mere record of travel. C. W. W.

Earl Percy's 'Asiatic Turkey.'*

Lord Percy, who has travelled in Asiatic Turkey on two previous occasions, here describes a visit to the wild Alpine district near the Persian frontier, which Chaldean and Kurd intrigues and forays keep in a perpetual state of turmoil. From Konia, which was reached by rail, the author's route lay through Nigdeh, Kaisariyeh, Geuksun, Kharput, and Mush to Bitlis, crossing Anti-Taurus, and crossing and re-crossing the Taurus range. From Bitlis the Chukh Dagh was crossed to Kochanes, and the journey was continued by Julamerk, the Jelu Dagh, Diza, Neri, and Rowandiz to Altun Keupri, where a raft was constructed for the sail down the Lesser Zab and the Tigris to Baghdad.

Readers of the author's interesting and suggestive 'Notes from a Diary in Asiatic Turkey,' will find the present volume equally attractive and deserving of attention. The vivid pictures of daily life amongst the hardy mountaineers who dwell on the mountain slopes and in the deeply cut valleys of the Alps of Hakkiari, throw much additional light on the religious and political differences which convulse the district, and illustrate, as it were, the more reserved language of the official reports. The work should be studied by every politician who wishes to understand the relations between Turk, Kurd, and Christian in a district which at any moment may give birth to political questions of grave importance. To the geographer its value lies in the clearly worded topographical remarks on the various localities visited during the long journey eastward, and especially in the descriptions of the grand scenery of the truly Alpine district, of which the Jelu Dagh is approximately the centre. The illustrations of scenery, etc., reproduced with great technical skill from excellent photographs, are as beautiful and remarkable as those in the larger work of Mr. Lynch. It is to be regretted that the author has not always adhered to the R.G.S. system of spelling place-names. In some instances the French *dj* and *ou* have been used instead of the simple *j* and *u*; and there are uncorrected printer's errors, such as Meviana for Mevlana, Zu for Su, Adaya for Adalia. On p. 24 Isnik Geul is clearly an error for Sabanja Geul, as the railway does not run near the former. C. W. W.

Dr. McCrindle's 'Ancient India.'†

The comparatively small world of Indian antiquarian scholars, no less than the larger world of intelligent travellers, owe a debt of gratitude to Mr. McCrindle for having placed within easy reach of them a compact and handy series of references

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* 'Highlands of Asiatic Turkey.' By Earl Percy, M.P. 1 vol. E. Arnold, 1901.

† 'Ancient India.' J. W. McCrindle, M.A., LL.D. A. Constable & Co., Westminster.

to those classical authorities whose writings deal with Ancient India. The book before us is the last of the series. After dealing with the Indika of Ktesias, the Indika of Megasthenes and Arrian, the commerce and navigation of the Erythræan sea, Ptolemy's Indian geography, and the invasion of Alexander the Great, McCrindle whips in the series, as it were, with a volume which deals with Herodotus, Strabo, Pliny, and some dozen minor authorities—all under one cover. The book is consequently heavier and not quite so handy as its predecessors in the series, of which the adaptability of each separate volume to the capacity of an ordinary pocket, and its small consideration as an additional weight to a traveller's baggage, were by no means a contemptible attribute. The value of the series lies hardly more in the accuracy of translation and the scholarship exhibited by its author than in its ready accessibility to those political, military, and commercial wanderers whose business leads them into the remoter corners of our Indian Empire, and who can verify for themselves, as they go, the extraordinary accuracy of some, at least, of those old-world records of the changeless East. It is with the help of such practical scholars as McCrindle that the unwritten history of a country which has never produced a historian can be gradually unfolded by men whose knowledge of Greek literature probably ends with the Greek version of the New Testament; and the worst criticism which can be passed on this latest volume is that the author appears to be unconscious of the extent of the fresh information about ancient India which has been evolved with the assistance of those parts of the series which have preceded it. For more than a thousand years the world was indebted to classical authors for all that was known about India. When classical authors failed, the Chinese Buddhist pilgrims stepped in, and they were followed in turn by those medical Arab geographers (travellers, compilers, and plagiarists), who have left more record of outer India than of the actual peninsula. But never a Brahman philosopher, or Buddhist saint, has troubled his meditations by the sordid consideration of the passing story of the Eastern world; of the rise and fall of dynasties, or the great movement of its peoples; and if his geographical instincts were aroused at all, it was only by the necessity of seating his best and most potent god on the highest pinnacle of the remotest hills. Classical authority, both for the history and geography of India, commences with Herodotus about 450 years B.C. According to McCrindle, Herodotus possessed but "a vague and meagre knowledge of India," and consequently only three or four pages are devoted to a reproduction of some of his tales (including the famous story of the gold-digging ants), and giving us none of his historical or geographical indications. As a matter of fact, it is to Herodotus that we owe an account of the nations which in his time occupied the ancient Persian Empire, and it is remarkable that, of the nations mentioned by him as existing in Ariana (Afghanistan) and Baluchistan, almost every one is represented to-day by a so-called Afghan or Baluch tribe, under almost the same name and often in the same situation as those assigned by him. The assistance thus afforded to ethnographical inquiry has been most valuable, and indirectly the contribution to our knowledge of the ancient geography of the Indian borderland is hardly less so. Through the writings of Herodotus, we are able to appreciate the wide extent of those early Greek colonies that were spread through Central Asia (partly by the process of bodily transportation, and partly by voluntary exile) centuries before the Macedonian invasion of India. Indeed, it may fairly well be doubted whether any modern British official possesses a clearer idea of the ethnographical and geographical affinities of the nations and tribes inhabiting Asia between Syria and Indo-China at the present time, than that which was possessed by Herodotus four centuries and a half before Christ. Such knowledge, although it bears but indirectly upon India, hardly deserves to be

called "vague and meagre." Strabo and Pliny are treated with more liberality, and the book contains not only copious extracts from their works, but many valuable notes illustrating the text of them. But there are, now and then, indications that the author is not fully acquainted with the results of such inquiries as have been made, during the progress of recent surveys in Afghanistan and Baluchistan, into the antiquarian records of those countries. This is probably due to the official "confidential system" of preserving records. It is unnecessary, for instance, to quote Bunbury (p. 87) to the effect that the direct route between Herat and Kabul has "not been described in detail or traversed by any modern traveller." It was not only traversed, but surveyed by the officers of the Russo-Afghan Boundary Commission no less than fifteen years ago. Information to this extent at least is public property, although the records of that commission have been labelled "confidential" for a most unnecessary length of time. Nor can we admit any longer that Bampur represents the ancient capital of Gadrosia, seeing that the site of that ancient capital has been identified, and may be recognized under its ancient name considerably to the east of Bampur, and is so placed in the most recent survey maps. Such small items for criticism as these in a book so full of information, however, merely indicate its value as a whole. McCrindle's series has probably done more to awaken a general interest in the antiquarian records of the most interesting part of Asia than any work which has hitherto appeared. It should not only have its place in every geographical library, but part of it, at any rate, should be a familiar addition to the personal equipment of the Indian frontier official; for it is on the frontier chiefly that the light of antiquity is required to assist in unravelling the ethnographical problems of the present. An entire revision of our map knowledge of ancient India is one of the requirements of the age, and to this, again, the study of McCrindle's translations is almost a necessary introduction. T. H. H.

Merzbacher's 'Caucasus.' *

Herr Merzbacher's two very substantial volumes comprise a detailed account of the journeys of a mountaineer in the Central and Eastern Caucasus (that is, in the regions between Elbruz and the Dariel, and between that pass and the Caspian), and an abstract of the information the author has, with the most praiseworthy energy and perseverance, collected from the many literary sources available in Russian or European literature. In the first volume, which deals with the Central Caucasus, he has been anticipated to a certain extent by the papers and volumes of our own Alpine Clubmen, and the English reader will find himself among familiar names and scenes where comparatively little is altogether new to him. The German traveller and his companion, the late Herr Purtscheller, made, however, several new ascents and visited one or two valleys which had not been described by Mr. D. Freshfield and his comrades. He has collected and collated from Russian sources a variety of fresh details with respect to the mountain tribes. In the matter of mountain nomenclature and altitudes, he has been at great pains to revise the work of his predecessors. With regard to matters of nomenclature, Herr Merzbacher might perhaps have done well to give more weight to the following considerations. Individual summits not conspicuous from a valley have, as a rule, no distinctive names apart from the ridge to which they belong, while peaks prominent from the valleys have often as many names as there are valleys from which they are visible. When one of these names has been adopted in literature or in a

* 'Aus den Hochregionen des Kaukasus.' Wanderungen, Erlebnisse, Beobachtungen, von Gottfried Merzbacher. 2 vols. Leipzig: Duncker und Humblot. 1901.

Government Survey, it cannot be altered without serious inconvenience, and later travellers should, therefore, be very chary of meddling with the nomenclature of their predecessors, even when they see what they may consider good grounds for a change. With regard to heights in the Caucasus, the ultimate authority is, of course, the Government Survey, but this has not yet been definitely issued to the public, and since the advance sheets courteously communicated to mountaineers are not always consistent, it seems premature to assert that a final determination has been arrived at in all cases. There is no doubt, however, that if Herr Merzbacher is likely in his turn to fall under the revision of his successors, his own corrections are often just.

The main interest of the work for English readers lies in the full and graphic description of the highlands lying in a triangle, of which the apex is Vladikafkas and the base the Caspian sea, to which the general name of Daghestan—the mountain country—has been given. It would, we believe, be well worth while to translate this second volume into English. It furnishes the reader not only with the adventures of a mountaineer, but with a very complete and lively description of the physical characteristics of the region explored by the author. It describes in detail lofty ice-clad ridges and rugged glens lying outside the usual tracks of local traffic, and but feebly delineated even in the latest survey. It pictures in their own homes the brave mountain people who for so many years maintained their independence against the available forces of the Russian Empire, and who now furnish some of the best soldiers and generals to the Russian army.

The map and illustrations call for particular notice. The former, in three sheets, is in the main a reduction from the last Russian survey, and Herr Merzbacher has carefully evaded going beyond its available sheets (*e.g.* in the case of the Laila range south of Suanetia). He has probably introduced some corrections, but he has not adopted those made in Mr. Freshfield's map of the Central Caucasus, which have been proved to be accurate in several instances by recent explorers. Apart from such questions of detail, Herr Merzbacher deserves the thanks of all geographers for having placed at their disposal the first authentic physical map of the snowy groups of Daghestan.

The illustrations are numerous, and on the whole successful. Some may think that what they gain in picturesqueness, from having passed through the hands of an artist, is lost in the accuracy of detail, which only an untouched photograph can supply.

The work as a whole is most creditable to its author and publishers. Neither time nor trouble has been spared to make it as complete as possible in every respect, without any consideration for the preferences of "irresponsible indolent reviewers" or "circulating library" readers. Perhaps they do not exist in Germany! For the serious reader and the scientific mountaineer, Herr Merzbacher's two thousand pages are a perfect storehouse of information, given in a lively style, and pleasantly interspersed with personal adventure. An admirable index lightens the labour of consulting them.

AMERICA.

Conway's 'Bolivian Andes.'*

This valuable and entertaining book of travels, written with *élan* and *esprit*, is a welcome relief from the many dull and superficial volumes which add to the confusion of knowledge regarding South America.†

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* 'The Bolivian Andes.' By Sir Martin Conway. Harper Brothers. 1891.

† For the chief geographical results of the expedition, see *Geographical Journal*, vol. xiv. p. 14.

Sir Martin Conway, accompanied by two Alpine guides, left Southampton July 13, 1898, for La Paz, Bolivia, by the Panama route. Noting the vast accumulations of wreckage of the Panama canal enterprise, he ventures the opinion that the present canal company has made such progress that the "famous Culebra cutting appeared practically finished; . . . it has been excavated to the level of 45 metres above the sea." Engineers will probably not agree with the conclusions which he has drawn from this fact, nor yet, comparing Panama with Nicaragua, that "undoubtedly it would be well to have two canals," there not being sufficient commerce in sight to pay a net profit of two per cent. on one. The author is right about the deadly climate of the isthmus of Panama and its mortuary rival Guayaquil. At the latter place, the writer hereof, in 1881, was shown the statistics of the death rate for a period of many years. "When we have no epidemic, it averages 150 per 1000," said the cadaverous-looking doctor. At Lima, Sir Martin Conway "made haste to see the desiccated body of Pizarro in a glass box." The pious guardians of the remains of the polycephalous conqueror of Peru derived a considerable revenue, from 1868 to 1872, by selling the skull to any innocent traveller for two silver soles. The monotony of steamer life on the west coast, the Oroya railway, the abandoned terraces of Inca times near Lima, the *soroche* sickness in ascending the mountains, the wonderful brightness of the stars, the ride by rail from Mollendo to Puno, on Lake Titicaca, the first sight of the great dome of Sorata, the steamboat voyage on the lake, 12,500 feet above sea-level, the arrival at the "Alto" of La Paz, and the unique appearance of the city, lying in a gigantic gorge 1600 feet below, the view of Illimani, and details of life *en route* to La Paz, are described with the accomplished ease of an old traveller who has got very close to life and its surroundings during numerous voyages.

The author confirms the observations of many explorers regarding the former vast area of Lake Titicaca, which he believes once extended to "27° S. lat.," which would carry it far into the Argentine Republic, despite the fact that the Lipez barrier, 22° 30′ lat., seems clearly to define its ancient southern limit, although, before the uplifting of the Andes to their present level, there is abundant evidence that Lake Titicaca drained southward into the Colorado river of the Argentine Republic, which then flowed into the Atlantic at the present port of Bahia Blanca.

Sir Martin Conway has much to say about the Indian population of the Titicaca tableland and vicinity. He found some of the Aymarás "not unlike the natives in the barren gorges of the Kashmir Himalayas." Speaking of the *fincas*, or country estates in Bolivia: "A *finca* is a social unit. The land belongs to a proprietor, and so in a sense do the Indians dwelling upon it, but the proprietor's ownership is subject to a multitude of rights possessed by the Indians. They cultivate the owner's land, he providing the necessary seed. Each Indian, in return for his labour, yearly receives a certain amount of land for his own use." This sounds very arcadian, but it may be safely said that the yoke fastened to the neck of the Aymará and Quichua Indian by the Spanish Conquistador still remains there. Even the papal bull of Paul III., in 1537, declaring him "a man capable of understanding the faith and the Christian religion," did not greatly lighten his load, and he is still a beast of burden, holding his oppressor in deadly hatred. Hence, when Sir Martin Conway was making an instrumental survey past certain Indian villages, the inhabitants hostilized him and drove him to seek military protection, fearful that even their pantheistic gods were being insulted by the white man. One of Sir Martin's Alpine guides, Maquignaz, hit the nail when he said, "The white folks give employment, and so are the masters."

The author now gives us a fine description of his ascent of Illimani, one of the

monarch domes of the Andes, which he set out to scale on September 5. On the 9th he planted the Union Jack upon the summit, 21,200 feet above sea-level. The few chapters of his book devoted to this notable exploit in alpine climbing are graphically written. While the difficulties encountered were great, and taxed the courage and endurance of the bold traveller, they do not appear to have been so formidable as those encountered upon the slopes of that gigantic sentinel Sorata, which overlooks the cradle of the empire of the Incas on one side, and the interminable forest districts of the Amazon valley on the other. The season selected for Sorata, or Illampu, appears to have been unpropitious; the summit to be reached was the highest, called "Ancohuma." The ascent was commenced on September 20. From a height of about 16,000 feet, "a pair of gulls rose gradually 2000 or 3000 feet into the air; but at their highest, they were far below two condors soaring incredibly high aloft." This is interesting, for the very lofty flight of the condor has been disputed; but from the inter-andean plateau, condors may often be seen on the wing at an elevation probably exceeding 20,000 feet.

Sir Martin Conway, by a strenuous effort, nearly reached the crest of "Ancohuma," but was, at the end of the fourth day, driven back by severe snowstorms, and postponed the final dash for more favourable weather. Later, he again climbed to the altitude of his old camp, 20,000 feet. But Sorata had evidently determined to defeat the gallant explorer and his companions; for many days, the storms had been unusually severe. At the foot of the final peak, the snow was like flour, and by chance had drifted exactly to the side it was necessary to climb. The difficulties increased at every step. "Huge masses of ice overhung in cliffs 100 feet high. Vast crevasses split the face across. . . . No more than 600 feet remained to mount. . . . We came at last to the edge of a great crevasse, perhaps 50 feet wide, that split the whole slope across. It would have been possible to cross this, but we didn't try, for the slope beyond it, leading straight to the top, in perhaps 300 feet, was obviously unsafe in present conditions. It was a little steeper than the slope we had come up, and it was covered with the same powdery snow. . . With bitter regret I gave the word to return. . . . From the mean of eleven different measurements, the height of Ancohuma came out 21,700 feet. My corresponding figures for Illampu are 21,520 feet."

The author's visit to the town of Sorata, on the eastern slope of the great mountain; his chapter on the auriferous wealth of the Tipuani and other parts of the Beni valley; his description of the rubber forests of the same region, which now find an outlet for their products at Mollendo, on the Pacific coast; his visit to the gold-mines of Cusanaco and Yani, near La Paz; his last ride over the *puna* to Orur, where he took passage by railway to Antofagasta, and thence embarked for his homeward journey;—are all interesting chapters containing much useful information. The volume is extensively illustrated with views of mountain scenery, and it brings into geographical prominence a most attractive section of South America.

George Earl Church.

THE MONTHLY RECORD.

EUROPE.

The First Topographical Survey of Scotland.—Mr. C. G. Cash gives, in the *Scottish Geographical Magazine*, an interesting account of the first topographical survey of Scotland, executed during the last part of the sixteenth and first half of the seventeenth centuries, which, though it has been described before in published

works, is perhaps not widely known among the general public. The first idea of such a survey originated with Timothy Pont, son of a famous reforming clergyman, but of whose life and work little trustworthy information is recorded. In spite of the troublous times in which he lived (he was born soon after 1560) and the many difficulties of travel in those days among the wild inhabitants of the highlands, Pont seems to have carried out the work by his own unaided resources. He, however, died before 1625 without finding a publisher for his survey. His manuscripts might have been destroyed by damp and vermin had not King James learnt of their existence and ordered that they should be duly cared for. The work was next taken up by Sir John Scot, a landed proprietor and politician, born in 1585. He urged King James to have the sheets published, and undertook the superintendence of the work. For the revision and completion of Pont's maps he secured the services of Robert Gordon, a man of some note in the political affairs of his time, and an excellent geographer and cartographer, as is shown by his manuscript work still extant. His work met with countenance from both sides in the civil war, and in order to allow him to continue it unhindered he was exempted from all public burdens, although an appeal to the Parliament was twice necessary to secure the due execution of the warrant. In his work of editing the maps, Robert Gordon was assisted by his son James, who was probably born about 1615, and the preparation of the manuscript maps seems to have been completed about 1648. The eventual publication of the maps by the famous atlas-makers, Blaeu of Amsterdam, was brought about through the constant communication with Dutch scholars kept up by Sir John Scot, who had entrusted to William Blaeu the printing of two volumes of poetry by Scottish writers. Blaeu was considering the possibility of obtaining maps of Scotland for his famous Atlas, and an agreement was therefore arrived at after much correspondence for the publication by him of the maps prepared by Pont and the Gordons, Scot himself going across to Amsterdam to assist in the literary part of the work. The Scottish volume, with some maps of Ireland, was first issued in 1654, when it formed the fifth volume of the whole Atlas. In the final form, first issued in 1662, Scotland formed the sixth volume in a set of eleven or twelve. Mr. Cash gives a detailed account of the maps, of which 46 are detailed topographical maps of districts of Scotland, a river being frequently taken as the topographical unit.

Relief of the Ardennes.—Mr. Henryk Arçtowski believes that the plateau of the Ardennes is a plain of marine denudation. He points out that the rivers Lesse, Ourthe, Süre, and Vierre, which radiate from the Serpont monadnock, all suddenly turn, at intervals, at right angles to their normal course, and these bends lie in concentric circles as if the region has been denuded in concentric waves. In the Condroz region the parallel tributaries of the Hoyoux flow mainly in synclines of carboniferous limestone, and erosion has intensified the relief. No faultings explain the course of the Meuse across the Cambrian mass of Rocroi, which is an example of superposed drainage.

The Pre-glacial River-system of Thuringia.—In a paper printed in the *Mitteilungen* for the present year of the Geographical Society of Halle am Saale, and also issued separately in pamphlet form, Dr. E. Wüst endeavours to reconstruct the ancient drainage system of Thuringia from a study of the old river-deposits still traceable. He points out that, as the material brought from the far north during the glaciation of the country has become mingled with all the more recent river-deposits, the presence or absence of northern material may be taken as determining the age of such deposits in general, whether formed before or after the first glaciation of Thuringia. He then describes the position and apparent relations of the chief deposits now existing from which northern rock-material is absent. A

chain of such deposits runs north from the neighbourhood of Mellingen, on the Ilm, crossing the present course of the river and extending as far as Bastenberg on the southern edge of the zone of hills known as the Finne, the deposits occurring at a considerably higher level than the present river valley, but, generally speaking, falling regularly from south to north. This line, which evidently marks a former course of the Ilm, is prolonged across a part of the Finne by the ravine in which the Lossa now flows. North of this the water-parting between the Lossa and the Saubach reaches a height of some 700 feet, which is, therefore, the minimum altitude at which the old river can have flowed. This involves the supposition that a sinking of the strata to the south of the Finne must have been maintained well into Pleistocene times; and this would also account for the subsequent diversion of the Ilm into its present course. In the central basin of Thuringia, Dr. Wüst traces the courses of two main streams, which formed the principal drainage channels in Pleistocene times. The one which had its origin in the western part of the Thuringerwald, entered the central basin near Tonna, traversing the same in a generally north-east direction to the Sachsenburger gate. The other, which was the ancient representative of the Gera, flowed north from the neighbourhood of Erfurt, joining the first a little above the Sachsenburger gate. Unlike the Ilm, the united stream had already reached a level of 500 feet before passing through the Finne, for Dr. Wüst considers it probable that no important earth-movements have here occurred since this epoch, but that the Sachsenburger gate, as well as that of Nebra lower down the Unstrut, already existed in Pleistocene times. This view is borne out by a study of the deposits in the lower Unstrut valley. Still another chain of old river deposits occurs on the north side of the Saale valley between Kösen and Goseck, and from the absence from these of rocks derived from the upper Ilm region, Dr. Wüst concludes that the junction of the Ilm with the Saale took place in former times below the extreme limit of the deposits alluded to.

The Lake Region of Swedish Lapland.—A valuable contribution to our knowledge of the physical geography of this region has been made by Karl Ahlenius, who publishes the results of journeys made in 1899–1900 in the *Bulletin of the Geological Institution of the University of Upsala* (vol. v. part 1, No. 9). The region in question, which extends for at least 350 miles from north-east to south-west, parallel to the main Scandinavian range, had not previously been examined with any thoroughness from a limnological point of view. The writer of the paper alluded to devoted his chief attention to soundings and determinations of temperature in the lakes, the former, which ran to the number of over 1000, being made with rope and lead, and the latter with the reversing thermometer of Negretti and Zambra. The positions of the points of observation were fixed either by counting the strokes in rowing, or by noting the time, when making use of steamers, together with bearings derived from topographic maps. The various lakes are described in order, with full data as to their depths and other characters, the general results of the whole study being afterwards summarized as follows. The chains of lakes all run radially from the mountain mass in the form of so-called fringing lakes, following the north-west—south-east direction of the rivers, and everywhere forming parts of river valleys. Their upper ends are in general branched, as in the case of Hornafvan, Storuman, Wojmsee, etc. The western and north-western portions are narrow and fiord-like, frequently with depths of 350–650 feet. If we place the limit between deep and shallow basins at a depth of 80 feet—about a fourth of the average depth of the deeper lakes—we obtain a deep-water line separating the deep lakes to the west from the shallow lakes or portions of lakes to the east. It is marked in part by the occurrence of lines of islands, and partly by vast masses of shingle or moraine

material. What, it is asked, must be assigned as the cause which has led to this characteristic of the lakes? Dislocation might be adduced, but it can be shown that the deep-water line does not coincide minutely, although it does roughly, with the dividing line between the two main geological formations represented. Difficulties also exist in the way of supposing the fiord-like basins to have been hollowed out by glacial erosion, though both this and dislocation may have had something to do with their formation. It is considered more probable that they were in the main carved out by fluviatile erosion, the river system having apparently presented the same general features as at the present day long before the glacial epoch. The maintenance of the deep basins to the west may be attributed to the conservative action of the ice after its partial retreat, while the country to the east was largely covered by moraine material, the same action possibly also taking effect with respect to the post-archæan formations to the west, and so accounting for the general agreement between the geological and morphological boundaries. From the above, it would seem that many points of analogy exist between the lakes of Lapland and those of the English lake district.

Sarjekfjällen, Northern Sweden.—Mr. Axel Hamberg, who accompanied Prof. Nathorst on his voyage to Spitsbergen, has published in *Ymer* an account, which has also been printed separately, of his investigations in Sarjekfjällen. This district, which lies not far from the Norwegian boundary between the basins of the Stora and Lilla Luleälf, is the most mountainous in Sweden, though its highest point, the Sarjektjåcko, 6858 feet above sea-level, is lower than the Kebnekaise, 7003 feet, in the same range about 35 miles further north, which is the highest summit in Sweden. Mr. Hamberg describes the rocks—granitic, metamorphic, and Silurian—and discusses in great detail the effects of erosion during the Glacial Period and in later times, the present denudation, and the existing glaciers. A proof of the care with which Mr. Hamberg examined the district is the fact that he climbed about fifty summits, varying in height from 5500 to nearly 5900 feet, some of them several times. Sarjek had been ascended before—in 1879 by G. W. Bucht, and in 1881 by Charles Rabot. Many virgin summits still, however, remain to tempt the alpinist.

Changes of the Coast-line of Sweden.—In the *Proceedings* of the Geological Society of Upsala, Mr. Artur Hollender treats of the elevation of the land from an archæological standpoint. He has collected data respecting the localities where implements of the stone age have been found, and regards the line along which these occur in greatest numbers as the ancient coast-line, believing that in ancient times, as at the present day, people settled in greater numbers along the shore, because of the easier means of communication afforded by the sea. This view is confirmed by the fact that further inland, where archæological finds are less rich in the number of implements, the stone axes with shaft-holes are more numerous relatively to those without shaft-holes, whence it may be inferred that man did not penetrate into the interior till a later age. From his data the author has drawn a map showing the coast-line at the time when man first settled in Sweden. It diverges more and more from the present line as it proceeds northwards, and on the whole corresponds to the post-glacial limits of Sweden and Finland.

ASIA.

The Fedchenko Expedition to the Pamirs.—*Globus* (vol. 80, No. 16) quotes from the Turkestan *Viedomosti* details respecting the expedition to the Pamirs under O. A. Fedchenko, the despatch of which was recorded in the *Journal* a few months back. On July 8 (New Style) the expedition left Osh, in Ferghana,

crossing the Kizil Art pass on the 16th, and reaching the Pamirski post, by way of the Kara-kul and the Ak-baital pass, on the 23rd. The further route led by the Alichur Pamir, Lake Yeshil-kul, and the Koj-tesek pass to Shugnan, where the expedition was courteously received by the Bokharan authorities. From Khorog the Panj was followed along the Afghanistan frontier to Ishkashim, whence the return journey was made by almost the same route as on the outward march. The principal collections made are botanical, which include roots, bulbs, seeds, etc., as well as dried specimens. Zoological, geological and meteorological observations have also been made.

Explorations on the Upper Amu-daria and in Daghestan.—The last numbers of the Moscow geographical review *Zemlevyedenie* contain several interesting articles. N. V. Bogoyavlensky gives a sketch of the journey he made in 1898 with Count A. A. Bobrinsky and A. A. Semenoff to the upper Amu, during which journey the party visited lake Iskander-kul and parts of Hissar and Darvaz. Illness has prevented the traveller from giving a report on this journey at an earlier date. From Penjakent, the party went to the Kul-kalan plateau, 9200 feet high, where they found an interesting fauna, including scorpions, which live at this great height, and numerous *Gammaridea* in the small lakes, or rather the small stony basins which cover this mountain plateau. The Fanagha pass being still impassable at the time of their visit, they took another previously unexplored pass close by, but found on its summit such masses of snow that they had to place their tent-felts on the snow, and to take the horses over them to prevent the animals from sinking too deep. The neighbourhood of Lake Iskanderkul is well known. The party was anxious, however, to make a closer acquaintance with the inhabitants, who, according to Dr. Yavorsky, call themselves Macedoni, and might have been remnants of the Macedonian conqueror's troops. This name, however, was not known to the indigenes whom the party met with, although it is worth noticing that the ethnological features of the inhabitants, who name themselves Tajiks, are quite different from the features of the other Tajiks who live on the headwaters of the Amu. Crossing the Mura pass, the party enjoyed the sudden change in the vegetation and climate on descending from the Pamirs to the Bokhara valleys of the Surkhab, the Khingu, the Vanj, etc., where the khanates of Karateghin and Darvaz are situated. The author describes this granary of Bokhara, and mentions, among other things, the interesting habit of the inhabitants of a village, Bunai, in the valley of the Vanj, of making their summer dwellings in a kind of shanty built in trees in order to escape the bites of all sorts of reptiles. Continuing to follow the most picturesque and dangerous gorge of the Panj, already known from Regel's description, where the footpath runs along a narrow cornice on the extremely steep slope of high cliffs, the party reached the fertile valley of the Aksu, with its chief town Kulab. The villages in this neighbourhood are very wealthy, but only ruins of once very large towns are now seen at the junction of the Aksu with the Amu, which formerly was, as is known, one of the most populous parts of Central Asia. The article is accompanied by a few most beautiful photographs (valleys of the Surkhab and of Khingu) and a few woodcuts. The same number contains a valuable article, by N. I. Andrusoff, on a journey in Daghestan. The map of the Arak-meé anticlinal folding and numerous sketches and sections of the mountains are most interesting, as they show, as in the Rocky mountains, the formidable amount of upheaval, folding, and especially of erosion, to which the Cretaceous and Tertiary deposits have been subjected.

A New Railway to Central Asia.—The Russian Government has decided to build a new and important railway line in its Central Asian dominions, from

Orenburg to Tashkent. Its total length will be 1762 versts (1168 miles). From Orenburg the line will go south to Iletsk, past the Iletsk salt lakes, thence to Kazalinsk, on the Syr-daria, and along the valley of the Syr, past Perovsk, Julek, and Turkestan, to Tashkent. The first division of this line, from Orenburg to the Mugojar mountains, 270 miles, lies in a region well suited for agriculture. Then comes a stretch of land as far as Kazalinsk, which is only suited for nomad Kirghiz; while further on the railway will enter the valley of the Syr, which has already a population of nearly 1,500,000, and, owing to its fertility, offers facilities for immigrants. It is to be remarked that the new line will compete with the Transcaspian line for the export of raw cotton from the Tashkent region.

Lake Aral.—A small expedition, which was sent out last summer by the Turkestan Geographical Society to Lake Aral, under L. S. Berg, has succeeded in finding the landmark placed by General Tillo in 1874 at Kara-tamak, on the north-western shore of the lake. It appeared from a careful levelling that the level of the lake had risen since by 1·21 metre (4 feet).

The Baikal Hydrographic Expedition.—This expedition, which was composed of nine officers and seventy-four sailors, under Colonel Drizhenko, is now back at St. Petersburg, having continued its accurate surveys of the lake and its shores in its middle and northern portions. A map of the southern portion of the lake (on the scale of 4 miles to an inch) is already on sale, and it is hoped that the two other sheets will be ready next spring.

The Jungarian Gobi.—It is known that the greatest uncertainty prevails as to the age of the rocks that are found on the surface of the Gobi. Notwithstanding the most careful search, none of the recent Russian travellers have yet succeeded in finding any traces of the submergence of the Gobi—the lower terrace of the high plateau of Asia—during the Secondary period, except on its outskirts and its slopes. D. A. Klements having brought from his last journey to the Jungarian Gobi some samples of fossils, they were submitted to a careful examination by the Secretary of the St. Petersburg Mineralogical Society, Th. Chernysheff. The samples were taken from a spot situated to the east of Pyevtsoff's route from Kobdo to Guchen (1876), *i.e.* to the south of the Neish-naiman hills, 17 miles east of Gashiuk, and 7 miles north-west of Nyursu. There appear at this spot ash-grey sandstones and conglomerates dipping to the south-east, and to the south of them one finds marls and sandstones containing thin layers of coal, upon which Nyursu is built. The former are full of fossils, but in a state of disintegration, so that Klements was compelled to take big blocks of sandstone, from which the following fossils were obtained: Some Bryozoa (*Polypora*, *Fenestella*), badly preserved; the polypes *Stenopora columnaris*, Schloth, var. *ramosa multigemmata*, Waag.; and the shells of *Productus purdoni*, Dav., *P. asperulus*, Waag., *P. mexicanus*, Schum., *Chonetes transitionis*, Krot., *Rhynchopora nikitini*, Chern., *Reticularia lineata*, Mart., *Martiina semiglobosa*, Chern., *Spirifer cameratus*, Mart., *Bairdia curta*, M'Coy, and several other undefined forms. The character of this fauna is similar to that of the Artinsk horizon of the Urals (intermediate between Permian and Carboniferous), even more so than the fossils brought home by Loczy from Yerkalo, in the Lan-tsan-kiang valley, as well as from Tse-de in the province of Se-chuen, and from Chung-tien and Tali-shau, in Yunnan. It is also worthy of notice that the sandstones and conglomerates of Nyursu are petrographically as well similar to those of the Urals (*Memoirs of the St. Petersburg Mineralogical Society*, vol. xxxviii. 2, 1900).

Glaciation of Northern Siberia.—In the *Verhandlungen* of the St. Petersburg Mineralogical Society (xxxviii. 2), A. P. Gherasimoff gives a further confirmation of the extensive glaciation which took place in the highlands of the

Olekminsk gold-washings system, which was indicated in 1868 by P. Kropotkin, and later by V. Obrucheff. During his exploration of the left-bank tributaries of the Zhuya, M. Gherasimoff found that the present valleys must have been filled with ice, there being on their northern slopes a succession of glacial terraces running all at the same absolute height, and containing boulders brought across the mountain ridges from different localities. Occasionally the boulders are striated. He also establishes the fact that the quaternary deposits in the valleys, which sometimes attain the formidable thickness of 290 feet, contain glacial deposits. As a rule, the lowest layer is of fluviatile origin. It is covered with a great thickness of glacial boulder clay and fine mud, which are covered in their turn with river deposits. Glaciation has produced considerable changes in the former distribution of longitudinal and transversal valleys.

Lieut. Kozloff's Expedition.—The Russian newspapers announce that the leaders of the Tibet Expedition, Lieutenants Kozloff and Kaznakoff, are already on their way from Tsaidam to Kiakhta. It is hoped that in January next they will be the guests of the Geographical Society at St. Petersburg.

Mount Bielukha, Altai Range.—This mountain mass in the Altai range, from which flow the headwaters of the Ob river, has been several times visited by M. Sapozhnikof, and on one occasion he and his companions ascended to the saddle between the two summits (*Izvestiya* of the Imperial Russian Geographical Society, xxxv. 5 and xxxvii. 2). The mass, surmounted by two irregular pyramids, descends in an almost perpendicular wall of rock northwards to the Ak-kem glacier, and more gently southwards to the Katun glacier. To the Bielukha group also belong a lofty snowy plateau adjoining the western summit on the north-west side, and a sharp ridge jutting out north-eastwards from the eastern summit, so that the Ak-kem glacier lies in a semicircle of mountains. The only previous determination of the height of Bielukha was that of Gebler in 1835, who concluded that it must rise at least 11,000 feet above sea-level. M. Sapozhnikof, from several angular measurements, found the mean to be about 14,800 feet for the eastern, and 14,500 for the western summit. The height of the saddle was obtained from the readings of two aneroids, which, corrected for known errors, gave identical results, and the calculated height was about 13,300 feet, which exceeds that of any other elevation in the Katun range. The large quantity of snow on the Bielukha is very noticeable, and has given rise not only to the Russian name, but also the Kalmuk, Ak-siura, and the Kirghiz, Musdu-tau. On his last journey in 1899, M. Sapozhnikof explored the upper valley of the Kochurla, tributary of the Katun, till then unknown to European travellers. Twenty-three miles from the mouth of the Kochurla is a lake 3 miles long, with a maximum breadth of 700 yards. In the middle the depth is 175 feet. The water is muddy, and the temperature in the summer, when M. Sapozhnikof crossed the lake, varied from 48° to 54° Fahr. Its surface lies 5700 feet above sea-level. The lake is marked in rough outline on the map of the Omsk Staff, but of the valley beyond no details are given. This valley is narrow, with rocky cliffs, old moraines, and some wood. The Yoldo-airi falls in cascades into the Kochurla on the right bank 2½ miles above the lake, and 1½ mile further the Miush-tu-airi and the Kani-airi unite to form the river. The former of these M. Sapozhnikof traced to the glacier from which it flows.

Orthography of Place-names in the Philippines.—Since the acquisition of the Philippines by the United States, much difficulty has been experienced with regard to the spelling of the place-names in the islands, owing to the various systems in use. It was felt especially by the Hydrographic Office in connection with the issue of charts, and an appeal for advice to the United States Board on Geographic Names led to the decision that the names in current use, as shown on the best

Spanish official maps and charts, should be followed. In accordance with this decision, a list of about four thousand coast-wise names has been drawn up and published as a special report of the board above mentioned. Another list of about six thousand names has been drawn up under the direction of the Rev. José Algue, S.J., of the Manila Observatory, and printed by the Coast and Geodetic Survey, as an introduction to its 'Atlas of the Philippine Islands.' It has been provisionally accepted by the Board of Geographic Names, whose own list, which in part overlapped the other, has been brought into harmony with it by the alteration of the spelling in the few cases where a difference existed. In the adoption of the board's list, uniformity of spelling rather than facility of pronunciation has been kept in view, and in the case of both a knowledge of Spanish usage will be necessary in order to arrive at a correct pronunciation. Even in the case of Malay words, the Spanish spelling is retained, which is perhaps to be regretted owing to the unusual pronunciation of certain letters, especially *y*, *z*, *c*, and *j*, in that language. By rule 7 of the R.G.S. system, it is laid down that the orthography adopted by other powers in the case of native names in countries under their dominion is to be disregarded, and the British system substituted, a strict adherence to which would forbid the use of the board's system in this country. But the case is perhaps one which would call for a special exception.

AFRICA.

The Dakhla Oasis.—The excellent monograph on the Farafra oasis (*ante*, p. 442), written by Mr. H. J. Beadnell, and published as a part of the report of the geological survey of Egypt for 1899, has been followed by another on the oasis of Dakhla, to the survey of which two months were devoted in the summer of 1898 (Survey Report, 1899, part iv.). Although written in 1900, the report has only been issued during the present year. It supplements in many ways the report on the oases of Dakhla and Kharga, written last year by Mr. A. R. Guest, and summarized in the *Journal* for December last. Mr. Beadnell begins by describing the caravan routes connecting Dakhla with the other oases near, and with the Nile valley at Beniadi. Besides those frequented at the present day, traces of others, now disused, were seen, including one running west from Mut, the most southerly village in the oasis, which the author supposes to have once led to the distant oasis of Kufra, though the great extent and height of the dunes in this direction would probably make the route impracticable at the present day. The main topographical feature in the surroundings of the oasis is the bold escarpment facing southwards and running generally W.N.W. and E.S.E. for at least 125 miles. It separates two entirely different types of country—to the south the low-lying expanse of sandstone, gently undulating and rising imperceptibly to the south; and to the north the high limestone plateau stretching with little alteration of character some 250 miles to the neighbourhood of the Fayum. The cliff is broken into a number of promontories with bays between them, at the extremities of which the beds are cut back so that a gradual slope to the plateau is formed. One of these bays, that to the east of Birbaya, proved to run back further than had been supposed. Owing to differences of character, the lower beds of the cliff stand out and form a low subsidiary plateau and escarpment, the edge being from 2 to 4 miles from the main cliff. The cultivated lands and palm groves, which exceed in extent those of either of the other oases in the Libyan desert, lie, with the villages, on the low ground to the south. The cultivated area, separated into an eastern and western portion by a strip of barren desert, has an extent of 41 square miles, the cultivable but unused land one of 34 square miles, while salines, saliferous land, marsh, and pools, make up other 11 square miles. The

southern route between Dakhla and Kharga was surveyed for the first time by Mr. Beadnell's party, the whole distance being measured by a steel tape; and as the longitude of Kharga was similarly fixed from the Nile valley by Dr. Ball, the resulting longitude of Kasr Dakhl, which is placed 5′ 1″ further west than by Jordan, the surveyor of the Rohlfs Expedition, cannot be greatly in error. Mr. Beadnell gives detailed maps of the chief groups of villages in the oasis, and describes very fully the wells and water-supply of each. The recent fall of the water-level in the wells is ascribed by him to the injudicious sinking of new wells, which often bring inferior land into cultivation while doing enormous damage to first-class wells irrigating good ground. There are large areas of good land uncultivated for want of wells, and it is eminently desirable that Government should take over the full control of future boring operations. The introduction of water-lifting appliances is also a desideratum, while experiments by boring in search of a second water-bearing stratum might lead to valuable results. The entire supply is at present derived from a thick bed of sandstone underlain by a black clay which has not yet been penetrated. Geologically, the various beds, both of the low ground and the escarpment, belong to the upper Cretaceous, the lower Eocene, beds of which form the escarpments around Farafra, first appearing a little distance to the north.

Exploration in the Eastern Congo Basin.—The least accessible portion of the Congo basin is probably that lying to the east of the upper course of the river, from Stanley falls to Nyangwe. Our knowledge of this extensive tract, covered in part by a section of the equatorial forest, is due to the journeys of two or three travellers only, the most important being those of Count von Götzen and of the Belgian officer, Lieut. Glorie, who in 1898 pushed his way to a point overlooking the central rift-valley near the south end of Lake Kivu. Some additions have lately been made to our knowledge by another Belgian expedition under Commandants Sillye and Siffer, which has traversed the region from south to north, first crossing the mountainous zone between the Luama and the northern portion of Lake Tanganyika, and afterwards following the eastern foot of the range to the north end of Kivu, whence the route was continued across the valleys of the Lowa and Lindi to Avakubi on the Aruwimi. The expedition left Kabambare in Manyema on November 24, 1900, and soon crossed the upper Luama, which drains a mountainous country in which the valleys are occupied by vast marshes. The crossing of the water-parting, which had an elevation of 5580 feet, was a work of much difficulty, owing to the steepness of the slopes. From Baraka, at the head of Burton gulf, the shore of Tanganyika was followed northwards, the route afterwards passing between the Rusizi and the western cliff of the rift-valley, which was climbed, near the south end of Kivu, to the village of Gwese, the terminus of the Glorie expedition, the itineraries of the two expeditions being thus linked in a satisfactory manner. In the gorge by which the Rusizi leaves Lake Kivu a natural bridge was discovered. Abreast of Lake Kivu the escarpment falls almost sheer to the lake, and the native path hugs the mountain slopes. The valleys between were cultivated and well peopled. To the north-west of Kivu the mountains rise, in a succession of terraces, to a height of 8000 feet. Travelling is excessively difficult, by reason of the thick vegetation, and, in places, of the precipitous rocks, there being no frequented path. Thick forests of bamboo were met with in the upper region. The great forest was reached fifteen days after leaving Kivu, during which a constant succession of mountain spurs separated by swampy valleys was crossed. The Lowa, upper branches of which, as well as of the Lindi, had previously been crossed, was reached on February 12, and a post established on its banks, after which the route was continued north to Avakubi.

Explorations in the Northern Kamerun.—The expedition to the northern interior of the Kamerun, under the command of Captain von Schimmelpfennig, to which allusion was made in the *Journal* a few months back, was successful in exploring a considerable area of unknown country to the north of the Sanaga, though we regret to learn that the leader has died since his return to the coast. His reports on the expedition, which left the Yaunde station on March 19 last, are printed in the *Deutsches Kolonialblatt* for August 1, and in the third number for the present year of the *Mitteilungen aus den Deutschen Schutzgebieten*. The route led first north across the Sanaga into the hilly country between the main stream and its important northern tributary the Mbam, the course of which has hitherto been laid down on our maps from hearsay only. The district is inhabited by the Vute tribe, and was in part traversed by Lieut. Morgen in 1890, though it has since remained very imperfectly known. The inhabitants were very shy, but showed themselves friendly when once relations could be opened with them. After a number of difficult marches the residence of the chief Ngutte, situated on a picturesque range of hills, was reached, and was found to lie some 30 miles to the north of the position assigned to it on Langhans' map, the chief having apparently shifted his residence. From this point the expedition turned south-west, through grass-land, towards the Mbam; a hitherto unknown tributary, the Mpem, a stream of some importance, being crossed *en route*. The Mbam itself was found to be obstructed by rapids both above and below the crossing-place. The country in front was intersected by hills, varying in height above the sea from 5000 to 6500 feet. Though used to some extent by the natives, the path to the west was found with some difficulty. The people, who belong to a tribe distinct from the Vute, but bearing considerable resemblance to the Bakoko, were on the whole friendly, though at one point a plot to plunder the caravan was only frustrated by the use of force. The country abounded in elephants, rubber, and oil-palms, and is said to offer good prospects for trade. Much was heard of an important town to the north, named Bafu, of the vast size of which fabulous accounts were given. The expedition finally reached Yabassi on the Vuri, whence the return seems to have been made direct to Duala, the capital of the colony. The same number of the *Deutsches Kolonialblatt* also contains an interesting account of a recent visit, by Herr Diehl, to the Manenguba range, which bounds the Vuri basin on the north. An ascent was made of Mount Epocha, an extinct crater lying north of the main range, from which it is separated by a broad valley. To the north and east a well-peopled plain was seen to extend, and behind it rose a high plateau, topped by still higher mountains. An isolated wooded mountain, 6500 feet high, was noticed to the south-east. Both the country and people made a favourable impression, and, the climate being comparatively temperate, Herr Diehl considers that European settlers might find there a scope for their energies.

The Lenfant Expedition on the Niger.—Some account of the expedition under Captain Lenfant, which ascended the Niger in a flotilla of boats during the spring and summer of 1901, for the purpose of carrying supplies to the new military territory between the Niger and Lake Chad, is given in the October number of the *Bulletin of the Comité de l'Afrique Française*. Although the navigation of the river was successfully accomplished, it was only after heroic efforts that the difficulties arising from the low state of the water could be overcome. The stores were transshipped from the ocean steamer at the French enclave on the Forcados mouth of the Niger, the journey as far as Geba (twelve days) being made on a stern-wheeler placed at the disposal of the expedition by the Niger Company. The personnel and stores (amounting to 60 tons) were then embarked on ten barges, which had been towed so far, and the difficulties of the voyage at once began, the

stream being likened to the Rhone at the period of low water, while the thick vegetation on the banks added another obstacle. The 5-mile stretch between Leaba and Wuru presented still more formidable difficulties, the river being hemmed in between precipitous banks and bristling with pointed rocks, among which the stream ran with eddies and whirlpools. The only means of advance was by hauling on tow-lines made fast to the rocks ahead. To pass the Wuru rapid, it was necessary to reduce the loads to 3½ tons per boat, or half the ordinary amount. For 200 yards the current was at the rate of 30 miles an hour. Hardly less difficult were the rapids of Potassi and Garafiri, at the latter of which the main rapid had to be ascended, as the lateral channels were dry, the river being almost at its lowest. Gaya was finally reached on May 7, the last obstacle having been surmounted at Sakassi, 10 miles north of Yellua. Finding, however, that no communication existed between Gaya and Zinder, Captain Lenfant decided to proceed to Sorbo Aussa, where the supplies arrived only just in time to relieve Colonel Peroz from a serious position, scarcity having already made itself felt. Captain Lenfant returned to Bajibo in August, but hoped to make the passage again during high water, when the difficulties would no doubt be lessened.

AMERICA.

Mining in British Columbia.—The annual report for 1900 of the Minister of Mines in British Columbia gives an interesting view of the mining development which has taken place in the province within the last few years. It is pointed out that although the total yearly output is not very great in comparison with that of some of the older mining countries, the wonderfully rapid growth of the mining industry is matter for satisfaction and confidence in the future. The total contribution from the mines of British Columbia to the wealth of the world since 1852 is reckoned at $152,000,000 (roughly £30,000,000), and of this sum $80,000,000 (£16,000,000) is credited to the eleven years 1890–1900. With the one exception of 1892, each year within this period shows a decided advance on the year preceding it, the production in 1900 ($16,000,000) being nearly 32 per cent. higher than that in 1899 ($12,000,000). In the total production since 1852 the largest items are placer gold, and coal and coke (62½ and 49 million dollars respectively), silver, lode gold, lead, and copper following in descending order. The greatest increase of late years is shown under the head of "lode mining" (as distinguished from coal mining and placer mining), lead showing the greatest increase of all. Its value rose from one million dollars in 1898 to over 2½ millions in 1900. Lode gold, silver, and copper show smaller, but still great, proportional increases. By far the most productive districts are West Kootenay and the coast districts, which together account for two-thirds of the whole output. But a more rapid proportional increase since 1898 is shown by the other districts (Cariboo, Cassiar, East Kootenay, Lillooet, and Yale), most of which have more than doubled their output since that year. That from East Kootenay has risen from $161,000 worth in 1898 to $2,800,000 worth in 1900. Both in 1899 and 1900 the mineral production of British Columbia exceeded that of all the other provinces of the dominion (apart from the Yukon territory) combined.

The Grand Cañon of the Colorado.—In June, 1900, Prof. W. M. Davis spent three weeks in the Grand Colorado region. He published a brief account of this trip in the *American Journal of Science* for October, 1900, and more recently a fuller description of it in the geological series, vol. v. No. 4 (May, 1901) of the *Bulletin* of the Museum of Comparative Zoölogy at Harvard. This contains a brief summary of previous work, and a bibliography. The following is a summary of Prof. Davis's results. The flexures and faults may have been formed very early in

the erosional history of the region, and almost exclusively before the cañon cycle. Two denudation stages can be traced—(*a*) the great denudation, which was far advanced before the uplift, which was followed by (*b*) the erosion of the cañon and the stripping of the weak strata from the plateaus. During the great erosion repeated movements took place, after each of which erosion may have reached an advanced stage, before the occurrence of the great series of disturbances. These have yet to be fully analyzed. The main river may be antecedent to some of the many dislocations, but is mainly consequent on displacements caused by faulting in the latter part of the great denudation and the form of the surface at that time. None of the side streams appear to be antecedent. The floor of the Toroweap valley is raised by heavy lava-flows which have withstood erosion of wet-weather floods. A wetter climate in the past has been assumed to explain certain features, but Prof. Davis thinks that the facts cited in support of this hypothesis may be interpreted without it.

The Koppename Expedition in Dutch Guiana.—The November number of the *Tijdschrift* of the Netherlands Geographical Society contains a report by Mr. L. A. Bakhuis on the progress made by his expedition up the Koppename river down to the end of August, at which date the party were in the neighbourhood of the Raleigh falls. On August 5 the baggage and boats of the expedition were placed on board the s.s. *Curaçao*, which entered the mouth of the Koppename the next day. The boats were then towed up the river by a steam-launch as far as Koppenkrisi, beyond which the state of the river made it necessary to proceed by rowing. On August 12, the Raleigh falls, where a camp had been made by an advance-party of the expedition, were reached. Here, while the boats and baggage were being moved above the falls—a 2-mile stretch strewn with rocks and islands —Mr. Bakhuis and the surveyor of the expedition made the ascent of the Voltzberg, an excessively steep isolated summit, in order to take bearings of the country in advance. A path had been cut through the bush, but the summit was inaccessible on the north and west, and it was only on going round to the south side that the ascent could be effected. A neighbouring summit was also climbed, and, the distance between them being measured trigonometrically and used as a base-line, it was possible to lay down the positions of the mountain range to the south-west, which forms the watershed of the Koppename, and of various other summits. The highest peaks of the range, which had hitherto been practically unknown, were put down at about 3600 feet in height. The upper course of the Koppename could only be conjectured, only a strip in the immediate neighbourhood of the Raleigh falls being visible. Meanwhile the boats had ascended the river to the next falls, distant two days and a half by rowing, and had discovered an important tributary entering on the right bank. This was to be ascended for two or three days, if possible, while the baggage was transported beyond the second falls. Mr. Bakhuis proposed, if possible, to make his way to the range forming the water-parting, and to cross over to the Saramakka river, following the latter on his return to the coast.

Austrian Explorations in Brazil.—Prof. von Wettstein, leader of the Expedition to Brazil of which mention was made in the February number of the *Journal* (p. 195), has reported as follows to the Vienna Academy of Sciences on the work accomplished. From the city of São Paulo as headquarters, excursions were first made for the purpose of gaining a general acquaintance with the surrounding country, special attention being paid to the transitional forms between the primæval forest of the coast region and the flora of the "campos" in the interior of the state. The slopes of the Serra do Mar—between São Paulo and the coast—clothed in the richest tropical vegetation, were visited, after which, in June, a longer excursion was undertaken for the thorough examination of the eastern

slope of the Serra do Paranopiacaba. An expedition, in July, into the interior of the states of São Paulo and Parana, was especially rich in results. Beyond the last railway station, a five-days' journey brought the travellers to the Salto Grande, the great fall of the Parana-Panema, which forms the limit of navigation. The great botanical interest of the neighbourhood held the explorers enthralled for a week. A voyage down-stream for several days was then made in canoes, which had been obtained from an Indian tribe resident in the neighbourhood, and the flora of the banks and islands studied. The discovery, among the rapids of the stream, of hitherto unknown types of the family of *Podostemonaceæ* calls for special mention. The return by land to the starting-point of the railway afforded the most favourable opportunity for the detailed study of the adaptation of plant-forms to the dry climate of the interior—that is to say, the xerophytic character of the "campos" flora. In the middle of August, the last major expedition from São Paulo was to be undertaken. It was to lead by Itapetininga, in the region of campos, and across the mountains to the tropical coast zone, and would to some extent afford a means of combining the results of previous excursions. The explorers hoped to be back in São Paulo early in September, and would then, after arranging for the despatch of the material collected, make their way to Rio de Janeiro. Down to August 11, the date of the report, more than nine thousand herbarium specimens and six large cases of preparations in spirits, as well as twenty cases of living plants, had been despatched to Vienna. Among them are many rare and some new forms, which will prove a valuable acquisition for the Vienna botanical garden. The expedition has now returned to Vienna.

POLAR REGIONS.

The Russo-Swedish Degree Measurement.—A third summer has been spent by Russian and Swedish geologists in Spitsbergen, and although good progress has been made with the field-work necessary for the measurement of an arc of the meridian, the whole labours have not yet, as had been hoped, been completed. The Russian section, as is announced in *Petermanns Mitteilungen*, was able, before sailing south, to effect the determination of all the points in the triangulation which fell to its share; but the Swedish party, which has worked throughout in the north of the group, and has therefore met with more hindrances from ice, has been unable to complete the whole programme. The north coast was so blocked by ice that it was found impossible to reach the sphere of action from the west, and only after much delay could it be gained by a circuitous route from the east. The linking of Treurenberg bay with the most northerly Russian point of triangulation on the Chydenius range could not be effected, nor could the most northerly points of the whole network, in the Seven islands, be fixed. It will therefore be necessary to return once more in 1902, if the important work is to reach a successful conclusion.

Borissoff's Expedition to Novaya Zemlya.—We learn from *Petermanns Mitteilungen* that the Russian expedition under Borissoff, which went out to Novaya Zemlya in the summer of 1900 (*Journal*, vol. xvi. p. 689) for surveying purposes, returned to Archangel on September 22. In spite of adverse circumstances, some valuable work appears to have been done. In the autumn of 1900, Borissoff passed through Matochkin Shar, and established a depôt at Chekin bay. Passing into the Kara sea, the ship was caught by ice and driven south, compelling the explorers to abandon her and make for the coast, which was reached at the Savin river. A march of 130 miles northward had then to be made before the depôt was reached. All the observations made during the summer were unfortunately lost with the ship. Early in the present year work was resumed by land,

and during a sledge expedition of a hundred and six days much of the interior was traversed for the first time, lakes and rivers being discovered. A survey of portions of the coast-line was also carried out.

Russian Surveys in the Kara Sea.—The Russian Hydrographical Expedition, which was at work during last summer in the Arctic ocean under Colonel Vilkitsky, has made careful surveys of the three channels which lead into the Kara sea, especially the Matochkin Shar. They made also surveys of the bay of Pechora. Navigation this year was rendered especially difficult by the cold winds.

The Drift-cask Experiment.—We have from time to time alluded to the scheme, first put forward by Commander (now Admiral) Melville of the *Jeannette* Expedition, for the investigation of polar currents by means of specially constructed casks set adrift in the ice (cf. *Journal*, vol. xii. p. 194). In 1899, the matter having been taken up by the Philadelphia Geographical Society at the instance of Mr. Henry G. Bryant, a number of these casks were placed on icefloes in the sea to the northward of Bering Strait by captains of whalers; and further attempts were afterwards made by the revenue cutter *Bear*, though at first without success. This year Captain Tuttle, of the *Bear*, has renewed his efforts, with the result that, in spite of the difficulty and danger of adventuring among the pack for the purpose, some fifteen more casks have been successfully placed on solid icefloes north of the East Siberian coast, the most northerly position at which this was done being in 72° 18′ N., 175° 10′ W., or some 40 miles to the north of the point at which the drift of the *Jeannette* commenced. It is confidently expected that some of the casks will eventually be found on the opposite side of the Arctic basin, though the time requisite for the passage is reckoned at probably four years. It is hoped that other casks may have this year been deposited by whalers to the north of Point Barrow.

The Swedish Antarctic Expedition.—The *Antarctic*, with Dr. Otto Nordenskiöld's expedition on board, left Gothenburg on October 16, and finally sailed for the south polar regions from Falmouth on the 26th. Dr. Nordenskiöld landed from the ship at Dover, and, during a short stay in London, was entertained at luncheon by Sir Clements Markham at the Royal Societies Club. The programme of the expedition was sketched in the October number of the *Journal*. Dr. Nordenskiöld's well-known qualifications in various branches of science, and especially geology, justify the anticipation of valuable results from the expedition.

New South Greenland.—In the *Bolletino della Soc. Geogr. Italiana*, July, 1901, Signor Faustino calls attention to a discovery said to have been made by an American whaling captain named Johnson. In lat. 67° 50′ S. and long. 48° 10′ W. he fell in with a large extent of land, which he named New South Greenland, and his discovery was confirmed by Morrell, who in 1823 followed the coast north-eastwards for 140 miles, and published a narrative of his voyage in 1832. Much doubt has been thrown on this discovery, and Johnson has even been regarded by some as a fabulous person. Signor Faustini maintains that there is no reason to reject Morrell's statement, and chiefly on the ground that no navigator has since visited that part of the Antarctic where the discovery was made. Morrell, having advanced as far as 70° 14′ S. lat., retraced his course to 65°, and then, near the meridian of 48° W. long., sailed south to 67° 52′, where he turned for the last time northwards and followed the coast till it made a bend to the north-west. Of subsequent navigators, Captain Larsen has reached the highest latitude in this sea, namely, 68° 10′ S. lat., but 10° of longitude farther west than Morrell's position. Perhaps Mr. W. S. Bruce may solve the problem.

GENERAL.

The Highest Balloon Ascent yet made.—A note in the November number of the *Deutsche Rundschau für Geographie* gives a brief description of a balloon ascent made on July 31 last by Drs. Berson and Süring, of the Berlin Meteorological Institute, during which a higher altitude was reached than had ever before been attained by man. The highest previous record was made during an ascent by Berson in 1894 (December 5), on which occasion an altitude of 9155 metres (30,022 feet) was reached. This has now been considerably exceeded, the two observers having passed the enormous altitude of 10,300 metres (33,790 feet). Up to 29,500 feet no unusual sensations were experienced, and even up to 33,600 feet the observations could be regularly continued, though consciousness was temporarily lost for brief intervals. Soon after this, however, one of the observers resisted all the efforts of his companion to arouse him, and the latter accordingly was forced to open the valves and so bring about a descent. The exertion thus involved deprived him too of consciousness, and neither of the observers awoke again until nearly an hour had passed, when the balloon was at a height of about 16,000 feet. At the highest point reached the barometer marked 202 mm., and as the balloon was still ascending, it would have been possible to have reached a still higher altitude. The thermometer stood at the freezing-point when a height of 12,470 feet had been reached, and at 33,600 marked −40° (C. or Fahr.).

Bergman's Physical Geography.—Torbern Bergman, born in 1735, was distinguished in many branches of science, and held the chair of chemistry in the University of Upsala. In 1766 he produced his 'Physisk Beskrifning öfver Jord-Klotet,' a work which Peschel styled the first physical geography in the strict sense of the term. In September Mr. John Lindquist read a paper at the Upsala University, now published in pamphlet form, in which he set forth and discussed the outlines of this work, and also gave a sketch of the author's life.

New Alpine Club.—We notice the recent foundation of a Russian Alpine Society at Moscow, which has among its foundators P. P. Semenoff, the Countess Uvaroff, Prof. D. N. Anuchin, B. A. Fedchenko, etc., and has elected as president A. K. von Meck. A Caucasian Alpine Club is in course of foundation.

OBITUARY.

Major F. C. Quicke.

The war in South Africa has claimed a third victim among British African explorers in the person of Major Francis Churchill Quicke, King's Dragoon Guards, who was killed in action at Riverdale, near Harrismith, on October 26. Major Quicke was the second son of the Rev. Charles Penrose Quicke, of Ashbrittle, Somerset, and at the time of his death was aged 34 years. He was educated at Eton, and entered the King's Dragoon Guards in 1887. The excellent work done by him as a member of Major Gibbons' second Zambezi expedition is fresh in the memory of our readers. When, on reaching Sesheke on the upper Zambezi, Major Gibbons and his two principal assistants separated in order to cover as large an extent of country as possible, Captain Quicke was commissioned to explore the northern section of the western basin of the upper Zambezi; and the result of his work was an excellent map of the upper Kwando and Lungwebungu rivers, which were then first followed throughout their whole extent.

Subsequently, after joining his chief at Lialui, he undertook a still more important expedition, in the course of which he went east to the Kafukwe river, north-west to the headstream of the Zambezi, and thence west by the Congo-Zambezi divide towards the West Coast—a total distance of over 2000 miles, whereby he completed a distance of over 5000 miles in eighteen and a half months. On reaching the coast, Mr. Bullough, who had fitted his yacht as a hospital-ship, took him on board in a serious condition. He hung between life and death for three weeks, but six weeks later was sufficiently recovered to travel to Kimberley, where he was given command of a troop of irregular horse, with which he took part in the relief of Mafeking, after which he rejoined his regiment at Aldershot. He was present at the meeting in December last, at which Major Gibbons gave the account of his expedition to the Society, and added a short narrative of his own experiences, which was printed, with Major Gibbons' paper, in the *Journal* for January last. His regiment having been ordered to South Africa in January last, he was promoted to the rank of brevet-major in September for conspicuous service in the field; but his promising career was cut short, as already stated, during a fight near Harrismith towards the end of October. Major Quicke had joined the Society in 1898, having previously made sporting trips in India and Somaliland.

Cav. L. M. d'Albertis.

The death occurred on September 2 last of Cav. Luigi Maria d'Albertis, one of the best known of the early explorers of the interior of New Guinea. Sig. d'Albertis, whose travels in New Guinea extended over a period of some five years, was first attracted to that region by a wish to gain acquaintance at first hand with the wonderful natural history productions of the island, on which Wallace especially had thrown some light during his travels in the Malay archipelago. He therefore gladly accepted the offer made by Dr. O. Beccari in 1872, to accompany that naturalist in one of his voyages of exploration. The south-west coast was the district chosen as the scene of operations, and here Sig. d'Albertis penetrated some distance towards the Arfak range, living for about a month in a Papuan hut at a height of 3600 feet, and reaching, during his excursions, an altitude of 5000 feet. Ill health compelled the abandonment of work for a time, but early in 1875 the traveller settled for some months on Yule island, near Port Moresby, obtaining valuable zoological collections from that previously almost unknown spot. In November of that year he joined Mr. Macfarlane in his pioneer voyage up the Fly river in the mission steamer *Ellangowan*, and in the following year returned to the river in a small steamer placed at his disposal by the New South Wales Government. On this occasion he was able to ascend the river almost to its sources—a distance of over 500 miles from the sea—and thus, for the first time, carried an itinerary to the centre of the vast blank which had hitherto marked the unknown interior on our maps. He also proved satisfactorily the great importance of the Fly river in the hydrographical system of the island. A third visit to the river was made in 1877, after which Sig. d'Albertis returned to Europe, and in November, 1878, presented an account of his explorations to the Society in a paper published in the first volume of the new series of its *Proceedings*. A full account of his wanderings was given to the public in 1880, in two large volumes, entitled, 'New Guinea: What I did and What I saw,' which long remained one of the principal sources of our knowledge of the people and natural history of the island.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1901–1902.

First Ordinary Meeting, November 11, 1901.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Capt. George Howard Fanshawe Abadie, Royal Scots; Archibald Stewart Annand; Colonel Alfred J. Arnold, D.S.O., 3rd Hussars; Lieut. Harold Cuthbert, D.S.O., Scots Guards; John Francis Etherington; Capt. Sudlow Harrison; William Petch Hewby, Political Officer, Northern Nigeria; Capt. Cecil Lowther, Scots Guards; Jesse Page; Alexander A. G. de Pagenkopff, Attaché to the Imperial Russian Ministry; Lionel Fox Pitt; Major-Gen. G. Upton Prior; Lieut. Cecil Godfred Rawling, Somerset Light Infantry; Geo. Whitfield Ray; Isaac Rooney; Charles Arthur Wood, M.A.*

The Papers read were:—

1. The President's Address.

2. "The Uganda Protectorate, Ruwenzori, and the Semliki Forest." By Sir Harry Johnston, K.C.B., G.C.M.G.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps—Glaciers. **Forel, Lugeon, and Muret.**
Jahrb. Schweiz. Alpenclub 36 (1900–1901): 169–191.
Les Variations périodiques des glaciers des Alpes. Par Dr. F. A. Forel, Dr. M. Lugeon, E. Muret. Vingt-unième rapport. 1900.

Alps—Historical. *Jahrb. Schweiz. Alpenclub* 36 (1900–1901): 192–209. **Knonau.**
Mittelalterlicher Verkehr und Handel über unsere Alpenpässe. Von G. Meyer von Knonau.

Alps—Morphology. *G.Z.* 7 (1901): 447–459. **Hettner.**
Ueber die Oberflächenformen der Hochalpen. Nach den Untersuchungen Edward Richter's. Von Alfred Hettner.

Austria—Dalmatia. *Mém. A. Dijon* 7 (1899–1900): 133–187. **Robin.**
Seize jours de croisière sur les cotes de Dalmatie. Par Albert Robin. *With Illustrations.*

Central Europe. *Fortnightly Rev.* 70 (1901): 605–614. **Coubertin.**
The Problem of Central Europe. By Baron Pierre de Coubertin.
On the race-problem in Austria-Hungary.

Central Europe. *G.Z.* 7 (1901): 361–377, 435–447. **Gradmann.**
Das mitteleuropäische Landschaftsbild nach seiner geschichtlichen Entwicklung. Von Dr. Rob. Gradmann.
This will be specially noticed.

Danube—Historical. *Archæologiai Ertesitö* 21 (1901): 28–34. **Milleker.**
Trois forts romains au Bas-Danube. Par Félix Milleker. [In Hungarian.]

Europe—Cartography. *La G., B.S.G. Paris* 3 (1901): 398–413, 507–514. **Derrécagaix.**
Des cartes d'Europe en 1900. Par Général Derrécagaix.
A historical sketch of the making of the maps of the various European countries.

France. *B.S. Languedoc. G.* 23 (1900): 308–329. **Gruyer.**
Saint-Guilhem-le-Désert. Par M. Paul Gruyer. *With Illustrations.*

France—Auvergne. *Jahrb. Schweiz. Alpenclub.* 36 (1900–1901): 132–148. **Zeller.**
Wanderungen im Vulkangebiet der Auvergne. Von Dr. R. Zeller. *With Illustrations.*

France—Brittany. *G.Z.* 7 (1901): 250–271. **Credner.**
Armorika. Ein Vortrag von Dr. Hermann Credner.
A sketch of the physical history of Brittany.

France—Speleology. *La G., B.S.G., Paris* 4 (1901): 35–45. **Martel.**
Treizième campagne souterraine. Par E.-A. Martel. *With Illustrations.*

Germany. **Ule.**
Der Würmsee (Starnbergersee) in Oberbayern. Eine Limnologische Studie, von Willi Ule. Herausgegeben mit unterstützung des Vereins für Erdkunde und der Carl Ritter-Stiftung zu Leipzig. With Atlas. (Wissenschaftliche Veröffentlichungen des Vereins für Erdkunde zu Leipzig. Fünfter Band.) Leipzig: Duncker & Humblot, 1901. Size 10 × 6½ (atlas 15½ × 12), pp. vi. and 212. *Presented by the Author.*
This will be the subject of a special note.

Germany. *Notizblatt V. Erdk. Darmstadt* (4) 21 (1900): 4–10. **Klemm.**
Bemerkungen zu F. Kinkelins Arbeit "Beiträge zur Geologie der Umgegend von Frankfurt A. M." Von G. Klemm. *With Plates.*
The writer criticizes some of the views expressed in the work referred to.

Germany. **Schwabach.**
Trade of Germany for the year 1900. Foreign Office, Annual No. 2671, 1901. Size 9½ × 6, pp. 46. *Price 2½d.*
In spite of a reaction from the unprecedented commercial activity which prevailed at the beginning of 1901, the trade of Germany still shows an increase for the year.

Germany. *Deutsche Rundschau G.* 23 (1901): 481–490. **Werner.**
Die Vogesen und ihre Thäler im Ober-Elsass. Von L. H. Werner. *With Illustrations.*

Germany. **Wüst.**
Beiträge zur Kenntnis des Flussnetzes Thüringens vor der ersten Vereisung des Landes. Von Dr. E. Wüst. (Sonder-Abdruck aus den Mitteilungen des Vereins für Erdkunde 1901.) Halle a. S., Tausch & Grosse, 1901. Size 9½ × 6½, pp. 18. *Map.*
This is the subject of a note (*ante*, p. 615).

Germany—Breslau. ——
Breslau. Lage, Natur u. Entwickelung. Eine Festgabe dem xiii. Deutschen Geographentage dargeboten vom Ortsausschusse. Breslau: C. T. Wiskott, 1901. Size 8½ × 5½. *With Maps and Illustrations.*

Germany—Coasts. *Globus* 79 (1901): 303-305. **Traeger.**
Die geologische Erforschung der Nordseewatten. Von Dr. Eugen Traeger.
A criticism of a paper by Reinhold Haage in the *Mitteilungen* of the Leipzig Geographical Society.

Germany—Magnetism. *Ann. Hydrographie* 29 (1901): 404-408. ———
Bericht der Deutschen Seewarte über die Ergebnisse der magnetischen Beobachtungen in dem deutschen Küstengebiete und in den deutschen Schutzgebieten während des Jahres 1900.

Germany—Rügen. *Naturw. Wochenschrift* 16 (1901): 393-396. **Graebner.**
Ein botanischer Ausflug nach Rügen. Von Dr. P. Graebner.

Greece. *B.S.G. Lille* 36 (1901): 5-16. **Fougères.**
Un Voyage en Arcadie. Par M. Fougères. *With Map, Plans, and Illustrations.*
A short description of the general physical features of the Peloponesus, followed by an account of recent archæological researches.

Holland—Census. *G.Z.* 7 (1901): 281-286. **Neukirch.**
Vorläufige Ergebnisse der 8 allgemeinen zehnjährigen Volkszählung im Königreich der Niederlande vom 31 Dezember 1899. Von Dr. Karl Neukirch.

Holland—Limburg. *Petermanns M.* 47 (1901): 187-190. **Zondervan.**
Steinkohlen in Niederländisch-Limburg. Von Henri Zondervan.

Hungary—Botany. *Jahrb. Ungar. Karpathen-V.* 28 (1901): 1-59. **Wagner.**
Die Gefässpflanzen des Túróczer Komitates. Von Johann. Wagner.

Hungary—Budapest. **Körösy.**
Die Sterblichkeit der Haupt- und Residenz-stadt Budapest in den Jahren 1891-1895 und deren Ursachen. Von Dr. Josef von Körösy. (Publicationen des Statistischen Bureaus der Haupt- und Residenzstadt Budapest, xxxi.) Berlin: Puttkammer und Mühlbrecht, 1901. Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. viii. and 216. *Presented by the Author.*

Hungary—Census. *Deutsche Rundschau G.* 23 (1901): 464-469. **Dienel.**
Die Ergebnisse der Volkszählung in Ungarn 1900. Von Julius Dienel.

Italy. *B.S.G. Italiana* 2 (1901): 684-711. **Crocioni.**
La toponomastica di Velletri. Nota del dott. G. Crocioni.

Italy. *B.S.G. Italiana* 2 (1901): 792-798. **Rosetti.**
Sul Rubicone. Nota del E. Rosetti.
Among the three competitors for identification with the ancient Rubicon, the writer is inclined to give the preference to the Fiumicino.

Italy. *Monthly Rev.* 4 (1901): 62-73. **Strutt.**
Famine and its Causes in Italy. By Edward C. Strutt.

Italy—Campagna. *La G., B.S.G. Paris* 3 (1901): 461-470. **Glangeaud.**
Les volcans du Latium et la Campagne Romaine. Par Ph. Glangeaud. *With Illustrations.*

Italy—Geographical Research. *Riv. G. Italiana* 8 (1901): 337-344. **Porro.**
I Problemi insoluti della geografia d'Italia. Comunicazione al IV. Congresso Geografico Italiano (III. Sezione) del Colonnello Carlo Porro.
The writer mentions a number of important geographical questions needing study in Italy, and urges that they should be taken up systematically.

Italy—Hail Prevention. *Meteorolog. Z.* 18 (1901): 275-278. **Pernter.**
Die Erfolge des Wetterschiessens in Italien, 1900. Von J. M. Pernter.
Statistics show that the cases in which success has been obtained are little more than half as numerous as the unsuccessful cases.

Italy—Naples. **Norway.**
Naples: Past and Present. By Arthur H. Norway. London: Methuen & Co., 1901. Size $8 \times 5\frac{1}{2}$, pp. xii. and 362. *Illustrations. Presented by the Publishers.*
This little work is not intended as a guide-book, but rather to supply the broad, general views which are lost in the detail necessary to such a guide. It is written in a pleasing style.

Norway. **Dundas.**
Trade of Norway for the year 1900. Foreign Office, Annual No. 2659. 1901. Size $9\frac{1}{2} \times 6$, pp. 112. *Price* $5\frac{1}{2}d$.

Norway. *La G., B.S.G. Paris* 8 (1901): 515–520. **Rabot.**
Nouvelles études de géographie physique dans la Norvège septentrionale. *With Maps and Illustration.*

Based on a work by J. H. L. Vogt in *Norges geologiske Undersögelser.*

Norway. *Alpine J.* 20 (1901): 443–449. **Gatty.**
Sulitelma. By Victor H. Gatty. *With Map and Illustration.*

Norway—Census. ———
Foreløbige Resultater af Folketællingen i Norge, 3 December, 1900. (Aperçu préliminaire des résultats du recensement au 3 décembre 1900 en Norvége.) Udgivne af det Statistiske Central Bureau. Kristiania: H. Aschehong & Co., 1901. Size 10 × 6½, pp. iv. and 22.

Norway—Census. *G.Z.* 7 (1901): 514–525. **Neukirch.**
Die Bevölkerung Norwegens nach der Zählung vom 3 Dezember 1900. Von Dr. Karl Neukirch.

Norway—North Cape. *Deutsche Rundschau G.* 23 (1901): 491–498. ———
Eine Reise nach dem Nordcap. Von L. D. *With Illustration.*

Norway—Tours. ———
The Most Picturesque Routes in Southern Norway. New Revised Edition. Edited by the Skien-Telemarkens Tourist Club. Skien, 1901. Size 7 × 5, pp. 74. *Maps and Illustrations. Presented by D. M. M. Crichton Somerville, Esq.*

Gives, besides a description of Skien and its environs, a description of ten of the most interesting routes from that centre through the lake-land of southern Norway.

Russia. **Cooke.**
Mineral and Metallurgical Industries of Russia. Foreign Office, Miscellaneous, No. 555, 1901. Size 9½ × 6, pp. 48. *Price* 2½*d.*

Russia. *Rev. G.* 49 (1901): 339–357. **Barré.**
Le peuplement et la colonisation de l'Empire russe. Par Paul Barré.

Russia—Caucasia—Daghestan. *Zemlevedenie* 8 (1901): 27–69. **Andrusoff.**
Journey to Daghestan, 1898. By N. Andrusoff. *Map, Sections, and Illustrations.*

Russia—Finland. *G.Z.* 7 (1901): 481–498. **Rosberg.**
Geographische Charakterbilder aus Finland. Dr. J. E. Rosberg.

Russia—Pechora. *Izvestiya Imp. Russ. G.S.* 37 (1901): 132–155. **Novosiltsoff.**
The Lower Pechora. By A. N. Novosiltsoff. [In Russian.]

Russia—St. Petersburg. **Baedeker.**
St. Petersburg und Umgebungen. Handbuch für Reisende, von K. Baedeker. Leipzig: Karl Baedeker, 1901. Size 6¼ × 4½, pp. xxiv. and 126. *Maps and Plans. Price* 4*m.*

This is extracted from the new, fifth, edition of Baedeker's Russia.

Russia—Ural Mountains. *Le Globe, Mem. S.G. Genève* 40 (1901): 1–53. **Duparc.**
Deux mois d'exploration dans l'Oural. (Rastesskaya Datcha.) Par le professeur Louis Duparc. *With Map.*

Scandinavia. **Hitchcock.**
Our Trade with Scandinavia, 1890–1900. By Frank H. Hitchcock. (U.S. Department of Agriculture. Section of Foreign Markets. Bulletin No. 22.) Washington, 1901. Size 9 × 6, pp. 124. *Presented by the U.S. Department of Agriculture.*

Spain. *B.R.S.G. Madrid* 43 (1901): 7–61. **Edrisi.**
Descripción de España, por Abu-Abd-allá-Mohamed-Al-Edrisi, traducida por D. Antonio Blázquez.

Spain. *B.R.S.G. Madrid* 43 (1901): 52–61. **Pérez.**
Notas de viajes por España. De Villena á Alcoy y Sierra Aitana. Por D. Eduardo Soler Pérez.

Spain—Rio Esla. *B.R.S.G. Madrid* 43 (1901): 62–111. **Valbuena.**
Sobre el origen del rio Esla. Por D. Antonio de Valbuena.

The Esla (formerly Estula) is the principal tributary of the Duero.

Submarine Valleys. **Lobley.**
The Sub-Oceanic Depression known as "La Fosse de Cap Breton," and the adjacent River Valleys of France and Spain. By Professor J. Logan Lobley. 1900. Size 8½ × 5½, pp. 14. *Presented by the Author.*

The author supports the conclusions of Prof. Hull as to the origin of the submarine depression off the mouth of the Adour, adducing further arguments in their favour.

Sweden. *Globus* 79 (1901): 368–369. **Palleske.**
Das Vorkommen des Pferdes in der schwedischen Steinzeit und der Fund von Ingelstad. Von R. Palleske. *With Illustrations.*

Sweden. **Hamberg.**
Geologiska och Fysiskt-Geografiska Undersökningar i Sarjekfjällen. Af Axel Hamberg. Stockholm, 1901. Size 9½ × 6½, pp. 102. *Maps and Illustrations.*

A careful study of the physical geography of a mountain district in northern Sweden. (See *ante*, p. 617.)

Sweden. **Hollender.**
Om Sveriges Nivåförändringar efter Människans Invandring. Af Artur Hollender. Stockholm, 1901. Size 8½ × 5½, pp. 231–274. *Map.*

On probable changes of level, and the resulting alterations in the position of the coast-line of Sweden. (See *ante*, p. 617.)

Sweden. ——
Göta Canal. Canal Route between Stockholm and Gothenburg, comprising the Södertelge, Göta and Trollhätte Canals. Stockholm, 1901. Size 8½ × 5½, pp. 46. *Map and Illustrations.*

Description of the "canal-route" from a tourist's point of view.

Sweden—Geology. *B. Geolog. I. University Upsala* 5 (1900): 1–27. **Nordenskjöld.**
Ueber die Kontaktverhältnisse zwischen den archæischen Porphyren ("Hälleflinten") und Graniten im nordöstlichen Småland. Von Otto Nordenskjöld. *With Map.*

Sweden—Lapland. *B. Geolog. I. University Upsala* 5 (1900): 28–80. **Ahlenius.**
Beiträge zur Kenntnis der Seenkettenregion in Schwedisch-Lappland. Von Karl Ahlenius. *With Maps.*

This is noticed in the Monthly Record (*ante*, p. 616).

Sweden and Norway—Commerce. *B.S.G. Lille* 36 (1901): 16–50. **Herteman.**
Étude présentée à la Société de Géographie de Lille. Par Paul Herteman.

The author discusses the facilities offered by Sweden and Norway for the opening of commercial and industrial relations with the north of France.

Switzerland. **Baedeker.**
Switzerland and the adjacent portions of Italy, Savoy, and Tyrol. Handbook for Travellers. By Karl Baedeker. Nineteenth Edition. Leipsic: Karl Baedeker; London: Dulau & Co. 1901. Size 6½ × 4½, pp. xxxviii. and 530. *Maps, Plans, and Panoramas. 2 copies, one presented by the Editor, the other by Messrs. Dulau & Co.*

Turkey—Constantinople. **Sarell.**
Trade of Constantinople for the years 1899 & 1900. Foreign Office, Annual No. 2650, 1901. Size 9½ × 6, pp. 40. *Maps and Plans. Price* 1*s.* 7*d.*

This report contains useful information, with maps, on the existing and projected railways of European and Asiatic Turkey, on the port of Haidar Pasha and its proposed improvement, on coal-mining in Asia Minor, and various other matters.

Turkey—Samos. *B.S.R. Belge G.* 25 (1901): 5–32, 81–124, 177–200. **Hauttecœur.**
La Principauté de Samos. Par Henry Hauttecœur.

Turkey—Skutari. *Riv. G. Italiana* 8 (1901): 420–431. **Baldacci.**
Note Statistiche sul "Vilayet" di Scutari e la legge della Montagna Albanese. Di A. Baldacci.

United Kingdom—Great Britain. **Baedeker.**
Great Britain. Handbook for Travellers. By K. Baedeker. Fifth Edition. Revised and augmented. Leipzic: Karl Baedeker; London: Dulau & Co. 1901. Size 6½ × 4½, pp. lxiv. and 600. *Maps and Plans. Price* 10*m. Presented by Messrs. Dulau & Co.*

This edition has been carefully revised and brought to date.

United Kingdom—River Mersey. **Nares.**
Report on the Present State of the Navigation of the River Mersey (1900) to the Right Hon. the Commissioners for the Conservancy of the River Mersey. By Vice-Admiral Sir G. S. Nares, K.C.B. London, 1901. Size 9½ × 6, pp. 22. *Presented by the Author.*

ASIA.

Afghanistan. *Deutsche Rundschau G.* 24 (1901): 28–31. **Syrkin.**
Afghanistan. Von Dr. N. Syrkin. *With Map.*

Arabia. *Questions Dipl. et Colon.* **12** (1901): 281–296. **d'Avril.**
Quelques notes sur l'Arabie. Par Baron A. d'Avril. *With Map.*
Deals with various political and historical questions.

Central Asia. **Filchner.**
Jahresb. Frankfurter V. G. u. Statistik **64** and **65** (1899–1901): 166–175.
Ritt über den Pamir und durch Ostturkestan. Von Leutnant W. Filchner.

Central Asia. *G.Z.* **7** (1901): 323–333, 377–383. **Toepfer.**
Der Weg von Osch nach Kaschgar. Aus dem Russischen. Von H. Toepfer.
Translation of a series of articles in the *Novoye Vremya.*

Central Asia—Tian Shan. *Izvestiya Imp. Russ. G.S.* **37** (1901): 58–69. **Korolkov.**
Visit to some glaciers of the Tian Shan. By Y. Korolkov. [In Russian.]

China. **Bigham.**
A Year in China, 1899–1900. With some account of Admiral Sir E. Seymour's Expedition. By Clive Bigham. London: Macmillan & Co., 1901. Size 9 × 6, pp. xii. and 234. *Maps and Illustrations. Presented by the Author.*

This work does not profess to be more than a record of personal experiences and impressions gained during eighteen months' stay in the Far East. These are presented, however, in a readable form, and should help towards the gaining an accurate idea of the present condition of things in the countries dealt with. The author took part in Admiral Seymour's Expedition, visited Manchuria, Eastern Siberia, and Korea, and penetrated inland to Western Sechuan.

China. **Parker.**
China. Her History, Diplomacy and Commerce from the earliest times to the present day. By E. H. Parker. London: John Murray, 1901. Size 8½ × 5½, pp. xx. and 332. *Maps and Frontispiece. Price 8s. net. Presented by the Publisher.*

A distinctly valuable work, presenting an instructive view of the history of the trade and foreign relations of the Chinese empire.

China—Manchuria. *Monthly Rev.* **5** (1901): 58–72. **Colquhoun.**
Manchuria in Transformation. By Archibald R. Colquhoun.

China—Manchuria. *J. United Service I. of India* **30** (1901): 213–236. **Dowding.**
The Russian Campaign in Manchuria, 1900. By Capt. H. H. Dowding, Essex Regiment. *With Map.*

China—Peking. *Tour du Monde* **7** (1901): 469–480. **Laguerie.**
Pékin, au lendemain de la délivrance des Légations. Par M. Villetard de Laguerie. *With Illustrations.*

China—Yangtse. *Ann. Hydrographie* **29** (1901): 387–391. **Hofmeier.**
Yangtze-Fahrt eines deutschen Linienschiffes. Reisebericht S. M. S. "Weissenburg," Kommandant Kapt. z. S. Hofmeier.

The voyage was made early in 1901. Observations on the depths and currents are given.

Chinese Empire. *Izvestiya Imp. Russ. G.S.* **37** (1901): 1–57. **Palibin.**
Preliminary Report of a Journey to Eastern Mongolia and China. By I. V. Palibin. [In Russian.]

Chinese Turkestan. **Church.**
Chinese Turkestan with Caravan and Rifle. By Percy W. Church. London: Rivingtons, 1901. Size 9 × 6, pp. xii. and 208. *Map and Illustrations. Price 10s. net. Presented by the Publishers.*

This is avowedly merely a record of travel and sport, little attention being paid by the author during his journey to geographical or political questions. His routes led him into some regions not often visited by Englishmen, especially in the Tian Shan, which was crossed to the south of Urumtsi.

Dutch East Indies. **Van den Berg.**
Bijd. Taal-, Land- en Volkenk. Ned.-Indië **9** (1901): 1–80.
De Mohammedaansche Vorsten in Nederlandsch-Indië. Door Prof. L. W. C. van den Berg.

On the ruling class among the Mohammedans of the Malay archipelago.

Eastern Asia—Meteorology. *Meteorolog. Z.* **18** (1901): 241–249. **Bergholz.**
Die Luftdruckverhältnisse, und die Windbewegungen im "Fernen Osten." Von P. Bergholz. *With Diagrams.*

Based on the work at the French Zikawei Observatory, near Shanghai.

French Indo-China. **Barthélemy.**
En Indo-Chine. 1896–1897. Tonquin, Haut Laos, Annam Septentrional, par le Marquis de Barthélemy. Paris: Plon-Nourrit et Cie. Size 7½ × 5, pp. 376. *Maps and Illustrations.*

The Count de Barthélemy has been one of the most energetic of recent French explorers in Indo-China. The results of one of his journeys were summarized in vol. xv. of the *Journal* (p. 175). The present work deals, however, with an earlier journey only, which led to Luang Prabang from Vinh, on the coast of Tong-king, in part by the valley of the Song-ka. The itinerary is clearly shown on five sheets on the scale of 1 : 250,000.

French Indo-China. *La G., B.S.G. Paris* **3** (1901): 489–498. **Barthélemy.**
Reconnaissance chez les Moïs Stiengs et aux environs du mont Djambra. Par Pierre de Barthélemy. *With Map and Illustration.*

The journey here described was carried out in 1899–1900, or subsequently to those noticed in the *Journal* for last year (vol. xv. p. 175).

French Indo-China. *La G., B.S.G. Paris* **4** (1901): 153–161. **Orléans.**
De Kratié à Nha-Trang, à travers la province du Dar-Lac. Par H. d'Orléans. *With Map.*

An account of the prince's latest journey undertaken early in 1901.

French Indo-China—Tongking. *B.S.G. Lille* **36** (1901): 100–114. ——
Impressions d'un Lillois au Tonkin.

Contains interesting details on the present condition and prospects of Tongking.

India. **Boulger.**
India in the Nineteenth Century. By Demetrius C. Boulger. London: H. Marshall & Son, 1901. Size 8½ × 5½, pp. viii. and 360. *Map and Illustrations. Price 6s. net. Presented by the Publishers.*

In view of the important problems now awaiting solution in India, this attempt to trace, for the benefit of the general public, the growth of the British Empire in that country to the present day should prove of much use. Although the author's views on some questions, *e.g.* the certainty of an ultimate struggle with Russia for the possession of India, will not meet with universal acceptance, his conclusions are for the most part sensible and unbiased. He considers that, with all deductions made, there is an undoubted balance to the good in what we have done to benefit India materially, and that the people as a whole appreciate the benefits of our rule. He is no doubt correct in holding that such appreciation is more just and general among the masses than among some of the classes forming educated society, who are naturally more disposed to regard the present rulers as intruders.

India—Antiquities. **Foote.**
Government Museum, Madras. Catalogue of the Prehistoric Antiquities. By R. Bruce Foote. Madras, 1901. Size 10 × 6, pp. xx. and 132. *Plates. Price 8s. Presented by the Madras Government Museum.*

India—Archæology. **Foote.**
Government Museum, Madras. Catalogue of the Prehistoric Antiquities. By R. Bruce Foote. Madras, 1901. Size 10 × 6, pp. xx. and 132. *Plates. Presented by the Museum.*

India—Assam. **McKee.**
Progress Report of Forest Administration in the Province of Assam for the year 1899–1900. By J. A. McKee. Size 13 × 8, pp. 71. Shillong, 1900. *With Map.*

India—Bombay. *Indian Antiquary* **30** (1901): 257–268. **Fleet.**
Notes on Indian History and Geography. By J. F. Fleet.

These notes relate to the Dharwar district of Southern Bombay.

India—Burma. **Scott and Hardiman.**
Gazetteer of Upper Burma and the Shan States. In Five Volumes. Compiled by J. George Scott, assisted by J. P. Hardiman. Part ii. vol. i. (pp. xii. and 550);

vol. ii. (pp. xvi. and 802); vol. iii. (pp. xii., 438, and viii.). Rangoon, 1901. Size 10½ × 7. *Plans. Presented by J. G. Scott, Esq.*

The two volumes of the first part of this valuable work were noticed in the last volume of the *Journal* (p. 549). Part ii. consists in an alphabetically arranged dictionary of the places of Upper Burma and the Shan States, and embodies a vast amount of information on the geography, history, ethnology, antiquities, etc., of those countries. The longer articles, such as those on Mandalay, the Salwin, etc., form complete monographs of the places dealt with.

India—Earthquake. *Naturw. Wochenschrift* **1** (1901): 2–4. **Walther.**

Die geologischen Wirkungen des indischen Erdbebens vom Jahre 1897. Von Prof. Johannes Walther. *With Illustrations.*

India—Famine Prevention. *Imp. and Asiatic Quarterly Rev.* **12** (1901): 33–51. **Innes.**

Prevention of Famine in India. By L. C. Innes.

Urges the importance of re-forestation as a preventive of drought.

India—Himálaya. **Workman.**

In the Ice World of Himálaya. Among the Peaks and Passes of Ladakh, Nubra, Suru, and Baltistan. By Fanny Bullock Workman and William Hunter Workman. London: T. Fisher Unwin, 1901. Size 8½ × 5½, pp. xvi. and 204. *Maps and Illustrations. Price 6s. Presented by the Publisher.*

A cheaper issue, apparently without modification, of the work already noticed in the *Journal.*

India—Irrigation. **Cotton.**

A Letter and Two other Papers on the water of the Great Rivers of India as essential to the prosperity of the Nation and the only possible means of preventing Famine, after Seventy-three Years' study of the subject. By Major-General F. C. Cotton, C.S.I. London: Rivingtons, 1901. Size 8½ × 5½, pp. 48. *Price 1s. Presented by the Publishers.*

India—Lushai Hills. *Records Botanical Surv. India* **1** (No. 13) (1901): 331–369. **Gage.**

A Botanical Tour in the South Lushai Hills. By Lieut. A. T. Gage. *With Map.*

The journey here briefly described was made in the spring of 1899. The bulk of the paper consists of a list of the plants collected, with statements as to their distribution.

India—Madras. *Globus* **80** (1901): 87–91. **Oppert.**

Die Felsentempel von Māmallapuram oder Seven Pagodas. Von Prof. G. Oppert. *With Illustrations.*

India—Sikkim. **O'Connor.**

Routes in Sikkim compiled in the Intelligence Branch of the Quartermaster-General's Department in India. By Captain W. F. O'Connor. Calcutta: 1900. Size 13 × 8½, pp. 90. *Maps. Presented by the Assist. Quarter-Master-General, Intelligence Branch.*

This is noticed in the *Journal* for August (p. 161).

Japan—Earthquake. **Davison.**

The Great Japanese Earthquake of October 28, 1891. By Charles Davison, SC.D. (From the *Geographical Journal* for June, 1901.) Size 10 × 6½, pp. 22. *Diagrams and Illustrations.*

Korea. *Petermanns M.* **47** (1901): 179–182. **Bretschneider.**

Russland und Korea. Von E. Bretschneider.

Analysis of the important Russian work on Korea, published last year under the auspices of the Russian Minister of Finance.

Korea. **Cubbins.**

Trade of Corea for the year 1900. Foreign Office, Annual No. 2687, 1901. Size 9¾ × 6, pp. 26. *Sketch-map. Price 3½d.*

Malay Archipelago—Amboina. **Baren.**

Tijds. K. Ned. Aard. Genoots. Amsterdam **18** (1901): 678–687.

Beschrijving van het schiereiland Letimor volgens W. Mickler. Door J. van Baren.

Description of the southern portion of Amboina from a survey carried out by Captain Mickler in 1867.

Malay Archipelago—Bali. **Schwartz.**
Tijds. Indische Taal-, Land- en Volkenk. **43** (1901): 554-560.

Rapport van eene reis van den Controleur voor de politieke aangelegenheden vergezeld door den Poenggawa van Soekasada Goesti Njoman Raka van 27 Januari t/m 7 Februari 1900. *With Map and Plan.*

Malay Archipelago—Borneo. *Mission Field* **46** (1901): 138-145, 366-375 **Leggatt.**
Life among the Dyaks. By the Rev. F. W. Leggatt. *With Illustrations.*

Malay Archipelago—Celebes. **Kruijt.**
Bijd. Taal-, Land- en Volkenk. Ned.-Indië **9** (1901): 148-160.

Het Ijzer in Midden-Celebes. Door Alb. C. Kruijt. *With Plates.*

Account of iron-smelting by the natives of Central Celebes. The existence of iron in this district has been known since the days of the old Dutch East India Company.

Malay Archipelago—Java. **Davids.**
Trade of Java for the year 1900. Foreign Office, Annual No. 2665, 1901. Size 10 × 6, pp. 22. *Price* 1½*d.*

Malay Archipelago—Java. **Kohlbrugge.**
Bijd. Taal-, Land- en Volkenk. Ned.-Indië **9** (1901): 81-147.

Die Tĕnggĕresen. Ein alter Javanischer Volksstamm. Ethnologische Studie. Von Dr. J. H. F. Kohlbrugge.

Malay Archipelago—Java. **Oudemans.**
K.A.W. Amsterdam, P. Sec. Sci. **3** (1901): 549-560.

On the contents of the sixth and last part of the Report "die Triangulation von Java," lately presented to the Academy, in the name of the Netherlands Government. By Prof. J. A. C. Oudemans. *With Chart.*

The author describes the method adopted for the calculations of altitudes.

Malay Archipelago—Sumatra. *Globus* **79** (1901): 245-250, 267-273, 278-281. **Hagen.**
Eine Besteigung des Vulkans Kaba auf Sumatra. Von Dr. B. Hagen. *With Map and Illustrations.*

This volcano was visited by Dr. H. O. Forbes during his explorations in the Malay Archipelago, but Dr. Hagen was able to devote more time to its examination, and to arrive at valuable deductions as to recent changes in the crater.

Malay States. **Treacher.**
Report by the Acting Resident-General of the Federated Malay States to His Excellency the Acting High Commissioner (Sir Frank A. Swettenham, K.C.M.G.). Kuala Lumpur, 1901. Size 13½ × 8½, pp. 20. *Diagrams.*

The report opens with a sketch of the history of the Malay States since they first came under British protection.

Persia—Isfahan. *Deutsche Rundschau G.* **23** (1901): 433-436. **Schulz-Baumgärtner.**
Isfahan, die persische Kunstmetropole. Von Dr. Walter Schulz-Baumgärtner. *With Illustrations.*

Philippine Islands. **Sinclair.**
Trade of Philippine Islands for the year 1900. Foreign Office, Annual No. 2638, 1901. Size 9½ × 6, pp. 26. *Price* 2*d.*

Russia—Siberia. *J. Anthrop I.* **31** (1901): 65-110. **Sumner.**
The Yakuts. Abridged from the Russian of Sieroshevski. By W. G. Sumner.

Russia—Siberia—Mammoth. *Globus* **80** (1901): 85-87. **Adelung.**
Ueber den jüngsten Fund einer Mammutleiche in Ostsibirien. Von Dr. N. v. Adelung.

Russia—Transcaucasia. *National G. Mag.* **12** (1901): 300-309. **Hovey.**
The Old Post-Road from Tiflis to Erivan. By Esther Lancraft Hovey. *Illustr.*

South-Western Asia. *National G. Mag.* **12** (1901): 249-265, 291-299. **Williams.**
The Link Relations of Southwestern Asia. By Talcott Williams, LL.D. *Maps.*

On the importance of South-Western Asia as a meeting-ground of the three continents of the Old World.

Turkey—Armenia. *B.S.G. de l'Est* **21** (1900): 505-521. **Artignan.**
Le commerce des Arméniens au XVII^e^ siècle. Par le docteur Artignan.

Turkey—Erzerum. **Lamb.**
Trade of Erzeroum and District for the year 1900. Foreign Office, Annual No. 2657, 1901. Size 9½ × 6, pp. 16. *Price* 1*d.*

Turkey—Mesopotamia. *Oester. Monats. Orient* **27** (1901): 63-68. ———
Aus Mesopotamien.

A report of the Austrian Consul at Baghdad on the trade and general condition of Mesopotamia.

Turkey—Syria. **Drummond-Hay.**
Trade of Beirut and the Coast of Syria for the year 1900. Foreign Office, Annual No. 2662, 1901. Size 10 × 6, pp. 20. *Price* 1½*d.*

AFRICA.

Africa—Historical. **Trant.**
Jahresb. Frankfurter V.G. u. Statistik **64** *and* **65** (1899-1901): 155-159.
Die Kenntnis Afrikas im Altertum. Von Dr. H. Trant.

Africa—Labour Question. *Kolon. Z.* **2** (1901): 273-274. **Peters.**
Organization der afrikanischen Arbeit. Von Carl Peters.

The writer recommends the introduction of compulsory labour in the African Colonies, the compulsion exercised by hunger in Europe being absent in the case of the Negro.

Africa—Zoology. *P. Zoolog. S.* 1901 (vol. ii.): 3-6. **Sclater.**
Mr. Sclater. Exhibition of an original water-colour painting, by Sir Harry Johnston, K.C.B., and remarks upon the newly discovered African mammal, the Okapi. *With Plate.*

Angola. **Nightingale.**
Trade of Angola for the year 1900. Foreign Office, Annual No. 2721, 1901. Size 9½ × 6, pp. 14. *Price* 1*d.*

Basutoland. *B.S. Neuchateloise G.* **13** (1901): 136-140. **Christol.**
Souvenir d'une excursion à la cascade de la Maletsunyane (Pays des Ba-Souto). Par Frédéric Christol. *With Illustration.*

British Possessions. *Rev. G.* **49** (1901): 289-306. **Leblond.**
La politique anglaise et l'Afrique. Par Lieut.-Colonel Leblond.

British South Africa. *B.S. Neuchateloise G.* **13** (1901): 84-98. **Béguin.**
De Nalolo au Mosi-Oa-Thunya (juillet-août 1898). Par Eugène Béguin.

Canary Islands. *T. Canadian I.* **7** (1901): 29-102. **Campbell.**
Critical examination of Spanish Documents relative to the Canary Islands, submitted to the writer by Senor Don Juan Bethencourt Alfonso, of Tenerife. By John Campbell, LL.D.

Cape Colony. *La G., B.S.G. Paris* **4** (1901): 162-167. **Déhérain.**
La toponymie de la colonie du cap de Bonne-Espérance au xviii.^e siècle. Par H. Déhérain.

Congo—Malaria. *B S. d'Études Colon.* **8** (1901): 543-550. **Broden.**
La prophylaxie de la malaria au Congo. Par A. Broden.

Dahomey. **Arthur.**
Trade of Dahomey for the year 1900. Foreign Office, Annual No. 2706, 1901. Size 9½ × 6, pp. 16. *Price* 1*d.*

Egypt. **Garstin.**
Egypt, No. 2 (1901). Despatch from His Majesty's Agent and Consul-General at Cairo, inclosing a Report as to Irrigation Projects on the Upper Nile, etc. By Sir William Garstin, K.C.M.G. London: Eyre & Spottiswoode, 1901. Size 13 × 8½, pp. 58. *Maps. Price* 3*s.* 6*d.*

This was fully dealt with in the October number of the *Journal.*

Egypt—Dakhla Oasis. **Beadnell.**
Survey Department, Public Works Ministry. Geological Survey Report, 1899. Part iv. Dakhla Oasis: its Topography and Geology. By Hugh J. L. Beadnell. Cairo, 1901. Size 10½ × 7½, pp. 108. *Maps and Sections.*

This is analyzed in the Monthly Record (*ante*, p. 621).

Egyptian Sudan. *P. Zoolog. S.* 1901 (vol. ii.): 291–298. **Dunn.**
Field-Notes on the Antelopes of the White Nile. By Captain Henry N. Dunn.

Egyptian Sudan. **Muriel.**
Report on the Forests of the Sudan. By C. E. Muriel. Cairo, 1901. Size 10 × 6½, pp. 24 and 9.

This was noticed in the Monthly Record for October (p. 442).

French Congo. *Deutsche Rundschau G.* **23** (1901): 514–516. **Cureau.**
Dr. Cureau's geodätische Arbeiten in Hoch-Ubangi. *With Map.*

French Congo. *La G., B.S.G. Paris* **3** (1901): 524–526. **Brousseau.**
Note sur la géologie du Gabon et des monts de Cristal.

French Congo. *La G., B.S.G. Paris* **4** (1901): 89–96. **Demars.**
Le plateau central du Congo français. Par Lieutenant Demars.

On the structure and morphology of the mountain zone between the middle Congo and the coast.

French Guinea. *Deutsche Rundschau G.* **23** (1901): 507–512. **Mohr.**
Französisch-Guinea. Von Dr. Kurt Paul Mohr.

French Sahara. *Questions Dipl. et Colon.* **12** (1901): 218–223. **De la Vaissière.**
Arguin et Portendick. Par R. de la Vaissière. *With Map.*

French Somali Coast. *Ann. G.* **10** (1901): 370–373. **Brisse.**
Djibouti et le chemin de fer du Harar. Par M. André Brisse.

French West Africa. **D'Ollone.**
Mission Hostains-D'Ollone. 1898–1900. De la Côte d'Ivoire au Soudan et à la Guinée par le Capitaine D'Ollone. Paris: Hachette et Cie, 1901. Size 10 × 6½, pp. 314. *Maps and Illustrations. Presented by the Publishers.*

A detailed account of the important expedition from the Ivory Coast to the Sudan which has frequently been alluded to in the *Journal* (cf. vol. xvi. p. 348). It forms a valuable addition to the literature of West Africa.

French West Africa. *Rev. G.* **49** (1901): 136–155, 204–227. **Dornin.**
Du Soudan au Maroc et à l'Algérie. Par Pierre Dornin. *With Map.*

A general sketch of the course of French advance in West and North Africa, with an appreciation of the value of the territories acquired, on which the writer takes a sober view.

French West Africa. *Scottish G. Mag.* **17** (1901): 414–429, 480–492. ———
France and the Penetration of the Central Sudan. *With Map.*

A summary of recent French activity in the Chad region.

Gambia. **Denton.**
Gambia. Report for 1900. Colonial Reports, Annual No. 325, 1901. Size 9½ × 6, pp. 18. *Price* 1½*d.*

German East Africa. *Kolon. Z.* **2** (1901): 292–295, 312–315. **Bendix.**
Einführung der Kommunalverwaltung in Deutsch-Ostafrica. Von Ludwig Bendix. *With Illustrations.*

On recent attempts on the part of the authorities in German East Africa to organize a system of government in which the natives shall be represented.

German East Africa. *Beiträge Kolonialpolitik* **3** (1901–1902): 69–89. **Engelhardt.**
Meine Reise durch Uhehe, die Ulanganiederung und Ubena über das Livingstone-Gebirge zum Nyassa. Von Hauptmann Engelhardt. *With Illustrations.*

German East Africa. *Globus* **80** (1901): 60–64. **Leue.**
Ein Marsch durch Uwinsa [Deutsch-Ostafrika]. Von A. Leue.

German East Africa. **Wauters.**
Voyages en Afrique de Bruxelles a Karéma—Le Royaume des Eléphants. Par A. J. Wauters. Bruxelles: J. Lebègue & Cie [not dated]. Size 9 × 6, pp. 180. *Illustrations.*

This little work is welcome as giving, for the first time, a full account of the first Belgian Expedition to East Africa (that of 1877 under Crespel and Cambier), which was sent out under the auspices of the International African Association.

Kamerun. *Deutsch. Kolonialblatt* **12** (1901): 550–553. **Diehl.**
Reisebericht des Richters Diehl.

Kamerun. *Deutsch. Kolonialblatt* **12** (1901): 548–550. **Schimmelpfennig.**
Expedition v. Schimmelpfennig. *With Sketch-maps.*

These two papers are dealt with in the Monthly Record (*ante*, p. 623).

Kamerun. *Deutsche Kolonialzeitung* **18** (1901): 245–247. **Scholze.**
Das Bakwirivolk. Von J. Scholze.

The Bakwiri inhabit the southern slopes of the Kamerun range.

Lagos. **Archer.**
Lagos Report for 1899. Colonial Reports, Annual No. 321, 1901. Size $9\frac{1}{2} \times 6$, pp. 28. *Price 2d.*

The interior is reported to be settling down and accepting civilization peaceably.

Morocco. *B.R.S.G. Madrid* **43** (1901): 112–143. **Díaz.**
Por España! Memoria premiada en el certamen de Melilla. Presentada por D. Francisco de Francisco y Díaz.

Discusses the importance of Melilla for Spanish relations with Africa.

Morocco. *Ann. G.* **10** (1901): 330–345. **Flotte-Roquevaire.**
Essai d'une carte hypsométrique du Maroc. Par M. R. de Flotte-Roquevaire. *With Map.*

Sahara. *Questions Dipl. et Colon.* **12** (1901): 65–72. **Terrier.**
Les deux rives françaises du Sahara. Par Auguste Terrier.

The writer shows into what intimate relations with the Sahara France has been brought by recent events, in the south no less than in the north.

Senegal. *La G., B.S.G. Paris* **4** (1901): 1–20. **Cligny et Rambaud.**
Le sol du Sénégal. Par Cligny et Rambaud. *With Maps and Illustrations.*

Transvaal. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **18** (1901): 628–667. **Hettema.**
Geschiedenis van het grondgebied der Zuid-Afrikaansche Republiek. Door H. Hettema, jun. *With Map.*

A sketch of the historical geography of the Transvaal.

Tunis. *Ann. G.* **10** (1901): 346–369. **Monchicourt.**
Le Massif de Mactar, Tunisie centrale. Par M. Ch. Monchicourt. *With Plates.*

Uganda. *J. Anthrop. I.* **31** (1901): 117–130. **Roscoe.**
Notes on the Manners and Customs of the Baganda. By the Rev. John Roscoe.

West Africa—Sailing Directions. ———
Africa Pilot. Part ii. Containing Sailing Directions for the West Coast of Africa, from the River Cameroon to the Cape of Good Hope, including the Islands of Ascension, St. Helena, and Gough, and the Tristan da Cunha Groups. Fifth Edition. London: J. D. Potter, 1901. Size $9\frac{1}{2} \times 6$, pp. xxii. and 386. *Index charts. Price 3s. 6d. Presented by the Hydrographer, Admiralty.*

NORTH AMERICA.

America. *Deutsche Rundschau G.* **23** (1901): 498–507. **Jüttner.**
Fortschritte der geographischen Forschungen und Reisen im Jahre 1900. 2. Amerika. Von Dr. J. M. Jüttner.

Canada—Eskimo. *B.S. Neuchateloise G.* **13** (1901): 158–176. **Pittard.**
Contribution à l'étude anthropologique des Esquimaux du Labrador et de la baie d'Hudson. Par le Dr. Eugène Pittard.

Canada—Newfoundland. **Clôture.**
A travers le Monde, Tour du Monde **7** (1901): 209–211, 217–219, 225–227.
La Question du French Shore. Par Joseph de Clôture. *Map and Illustrations.*

Canada—Ontario. *T. Canadian I.* **7** (1901): 139–186. **Wilson.**
Physical Geology of Central Ontario. By Alfred W. G. Wilson. *With Maps and Illustrations.*

Mexico. **Biorklund.**
Trade of Mexico for the year 1900. Foreign Office, Annual No. 2693, 1901. Size $9\frac{1}{2} \times 6$, pp. 42. *Price $2\frac{1}{2}d$.*

Niagara Falls. *T. Canadian I.* 7 (1901): 7–14. **Currie.**
On the Ancient Drainage at Niagara Falls. By P. W. Currie. *With Illustrations.*

The writer accepts the theory of Dr. J. W. Spencer in regard to the old water-courses at Niagara, adding proofs from his own observations.

North America. **Fountain.**
The Great Deserts and Forests of North America. By Paul Fountain. London: Longmans & Co., 1901. Size 9 × 6, pp. x. and 296. *Price 9s. 6d. net. Presented by the Publishers.*

Though dealing with regions well known both to the geographer and naturalist, this work stands distinctly above the general level of books of travel. The author possesses in a high degree the power, too often wanting in travellers, of presenting vivid pictures of nature and wild life, which enable the reader to whom the pleasure of actual travel is denied, to realize the true conditions of countries remote from his own. The book supplies an illustration of the fact that good work may be done without passing the limits of the fairly well known.

United States. *National G. Mag.* 12 (1901): 373–377. ——
Boundaries of Territorial Acquisitions. *With Map.*

Summarizes the conclusions of a conference, the report of which has lately been published by the Census Bureau.

United States. *National G. Mag.* 12 (1901): 362–369. **Moore.**
The Weather Bureau. By Willis Moore, LL.D.

A sketch of the progress of meteorological science in the United States.

United States. ——
Annual Reports of the War Department for the fiscal year ended June 30, 1900. Report of the Chief of Engineers. 8 Parts. Washington, 1900. Size 9½ × 6, pp. 5536. *Maps and Plates. Presented by the United States Army.*

United States—Arizona. *Rep. Smithsonian I.* (1899): 289–307. **Ward.**
The Petrified Forests of Arizona. By Lester F. Ward. *With Illustrations.*

Reprint of a report to the U.S. Geological Survey. The forests alluded to have recently been placed under adequate protection.

United States—California. *J. Geology* 9 (1901): 330–336. **Nutter.**
Sketch of the Geology of the Salinas Valley, California. By Edward Hoit Nutter. *With Maps and Sections.*

United States—Cement Industry. **Bell.**
Cement Industry of the United States. Foreign Office, Miscellaneous, No. 556, 1901. Size 9½ × 6, pp. 8. *Price ½d.*

United States—Coal and Coke. **Bell.**
Coal and Coke Trade of the United States. Foreign Office, Miscellaneous, No. 562, 1901. Size 10 × 6, pp. 20. *Price 1½d.*

United States—Horse Industry. **Erskine.**
Horse Industry in the United States. Foreign Office, Miscellaneous, No. 563, 1901. Size 9½ × 6, pp. 14. *Price 1d.*

United States—Idaho and Montana. **Goode.**
B. United States Geol. Surv. No. 170 (1900): pp. 66.
Survey of the Boundary Line between Idaho and Montana from the International Boundary to the crest of the Bitterroot Mountains. By Richard Urquhart Goode. *With Map and Illustrations.*

Field work for the fixing of this boundary was carried out in the years 1897–99.

United States—Indian Territory. **Fitch.**
B. United States Geol. Surv. No. 175 (1900): pp. 142.
Triangulation and Spirit Leveling in Indian Territory. By C. H. Fitch. *Maps.*

Gives the results of operations carried out from 1895 to 1898.

United States—Indiana. *J. Geology* 9 (1901): 437–438. **Campbell.**
Evidence of a local subsidence in the Interior. By John T. Campbell.

Bench-marks cut during levelling operations in 1883 show that a subsidence of 10 inches has since taken place at one spot. The Charleston earthquake is suggested as a cause.

United States—Kentucky. **Semple.**

The Anglo-Saxons of the Kentucky Mountains: A Study in Anthropogeography. By Miss Ellen Churchill Semple. (From the *Geographical Journal* for June, 1901.) Size 10 × 6½, pp. 36. *Illustrations.*

United States—Lakes. *Rep.* (*U.S.*) *Chief of Engineers* (1900): 5317–5401. ———

Northern and North-Western Lakes—Correcting and issuing Charts—Surveys—Water-levels. *With Map, Diagrams, etc.*

This report contains a large amount of information bearing on the hydrography of the great American lakes, including investigations of lake-levels, discharges of the connecting rivers, etc.

United States—Maine. **Williams and Gregory.**
B. United States Geol. Surv. No. 165 (1900): pp. 212.

Contributions to the Geology of Maine. By Henry S. Williams and Herbert E. Gregory. *With Maps and Plates.*

United States—Mississippi River. **Derby.**
Rep. (*U.S.*) *Chief of Engineers* (1900): 4551–4556.

Changes in Flood Heights, Fourth District, Mississippi River. By Maj. G. McC. Derby.

This is an appendix to the Annual Report of the Mississippi River Commission. The author shows that, owing to an apparent increase in the carrying capacity of the river-bed, there has been a marked change in the heights reached by floods at certain points.

United States—Oregon, etc. **Laidlaw.**

Trade and Agriculture of the State of Oregon, &c., for the year 1900. Foreign Office, Annual No. 2666, 1901. Size 10 × 6, pp. 52. *Price* 3*d.*

CENTRAL AND SOUTH AMERICA.

Argentine Republic. ———

Annuaire statistique de la Ville de Buénos-Ayres. X^{me} Année. 1900. Buénos-Ayres, 1901. Size 10½ × 7, pp. xxxii. and 342.

Argentine Republic. *Rev. G.* **49** (1901): 229–238. **Daireaux.**

Découvertes géographiques dans la République Argentine à l'occasion du conflit chileno-argentin. Par Émile Daireaux. *With Map.*

The title is somewhat misleading, the paper being a general sketch of the progress of geographical knowledge in Argentina, and of the origin of the boundary question with Chili.

Argentine Republic. **Segui.**

Congreso Nacional. Investigacion Parlamentaria sobre Agricultura, Ganaderia, Industrias Derivadas y Colonización. Anexo B. Provincia de Buenos Aires. Informe del Comisario Sr. Ingeniero D. Francisco Segui. Buenos Aires, 1898. Size 10½ × 7, pp. xiv. and 458. *Map. Presented by Dr. F. P. Moreno.*

An exhaustive report on the resources of the province of Buenos Aires, and on the best means of developing them.

Argentine Republic—La Plata Estuary. **Herrmann.**
Ann. Hydrographie **29** (1901): 313–315.

Die Gezeitenverhältnisse in der La Plata-Mündung und ihr Einfluss auf die Bodengestaltung. Nach "Estudios sobre puertos en la provincia de Buenos Aires." Von J. Herrmann. *With Chart.*

Argentine Republic—Santa Fé. **Brandt and Pommerenke.**

República Argentina. La Provincia de Santa Fé en el principio del siglo XX. Compilado . . . por Ernesto Brandt y Guillermo Pommerenke. Rosario, 1901. Buenos Aires: Compañia Sud-Americana de Billetes de Banco, 1901. Size 7 × 10½, pp. 380. *Map and Illustrations. Presented by Dr. F. P. Moreno.*

A useful description, profusely illustrated by reproductions of photographs, of the present state of one of the most flourishing departments of the Argentine Republic. The subjects touched upon include political organization, education, communications, commerce, industries, agriculture, etc.

Barbados. **Greaves.**

Barbados. Report for 1900. Colonial Reports, Annual No. 326, 1901. Size 9½ × 6, pp. 26. *Price* 2*d.*

Bolivia. ——

Bolivia, its Position, Products, and Prospects. London: Printed for Private Circulation, 1901. Size $8\frac{1}{2} \times 5\frac{1}{4}$, pp. 20. *Map.*

Written with a view to calling attention to the great commercial resources of Bolivia. The author's name does not appear, but the map is compiled by J. L. Moreno, of the Bolivian army.

Brazil—Birds. **Goeldi.**

Museu Paraense de Historia Natural e Ethnographia. Album de Aves Amazonicas organisado pelo Dr. Emilio A. Goeldi, Director do Museu Paraense. Supplemento Illustrativo a obra "Aves do Brazil," pelo Dr. Emilio A. Goeldi. 1900. Size $12 \times 9\frac{1}{2}$. *Plates.*

This is the first instalment of a supplement to Dr. Goeldi's great work on the Birds of Brazil, published between 1894 and 1900. There are twelve sheets, each giving coloured illustrations of birds grouped according to the natural orders, and shown in their natural environment.

Colombia. **McDougall.**

Trade of Barranquilla for the year 1900. Foreign Office, Annual No. 2660, 1901. Size 10×6, pp. 12. *Price* 1*d.*

The recent disturbances have had a very detrimental effect on trade.

Colombia. **Uribe.**

Anales Diplomaticos y Consulares de Colombia. Publicados bajo la dirección de Antonio Jose Uribe. Tomo Primero. Bogota, 1901. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 648 and lxxxiv.

Contains a detailed review of the boundary questions with Venezuela and Costa Rica.

Costa Rica. **Harrison.**

Trade of Costa Rica for the year 1900. Foreign Office, Annual No. 2661, 1901. Size 10×6, pp. 14. *Price* 1*d.*

Costa Rica. *La G., B.S.G. Paris* 3 (1901): 499–506. **Hulot.**

Une Mission française dans le Nord du Costa Rica. Par le Baron Hulot. *Map.*

On an expedition in 1898–99 under M. Jules Second.

Dutch Guiana. **Pigott.**

Trade of Dutch Guiana for the year 1900. Foreign Office, Annual No. 2656, 1901. Size $9\frac{1}{2} \times 6$, pp. 12. *Price* 1*d.*

Haiti. *Petermanns M.* 47 (1901): 169–178. **Tippenhauer.**

Beiträge zur Geologie Haïtis. Von L. Gentil Tippenhauer. V. Das La Selle-Gebirge, die Cul-de-Sac-Ebene und das Salzseengebiet. *With Maps.*

Peru. **St. John.**

Trade and Finances of Peru for the years 1899–1900. Foreign Office, Annual No. 2639, 1901. Size 10×6, pp. 48. *Price* 2½*d.*

Peru and Chile. ——

Peru and Chili. Circular of the Peruvian Foreign Office on the Arica and Tacna Question. London, 1901. Size $9\frac{1}{2} \times 6$, pp. 40.

Porto Rico. **Churchward.**

Trade of Porto Rico for the year 1900. Foreign Office, Annual No. 2647, 1901. Size $9\frac{1}{2} \times 6$, pp. 18. *Price* 1½*d.*

The recent improvement in trade is entirely to the advantage of the United States. Various enterprises for the development of the island have been projected, but are hanging fire for want of capital.

St. Christopher. *B. American G.S.* 33 (1901): 207–219. **Alexander.**

The Flora of Saint Christopher. By W. H. Alexander.

Venezuela. **Lemos.**

Trade of Ciudad Bolivar for the year 1900. Foreign Office, Annual No. 2633, 1901. Size $9\frac{1}{2} \times 6$, pp. 8. *Price* ½*d.*

West Indies—British Islands. *J.R. Colonial I.* 32 (1901): 509–537. **Walker.**

Impressions of the British West Indies. By Henry de R. Walker.

West Indies—Bush Fires. *West Indian B.* **2** (1901): 79–96. **Nicholls.**

Agricultural Conference, 1901. Legislation to Control Bush Fires. By H. A. Alford Nicholls, C.M.G., etc.

West Indies—Rubber. *West Indian B.* **2** (1901): 100–113. **Hart.**

Rubber Cultivation in the West Indies. By J. H. Hart, F.L.S. *Illustrations.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. *Rev. G.* **49** (1901): 239–264, 322–336. **Maistre.**

L'Australie; origine et constitution de la Commonwealth. Par Paul Maistre. *With Map.*

Caroline Islands. **Friedrichsen.**

Jahresb. Frankfurter V.G. u. Statistik **64** *and* **65** (1899–1901): 163–166.

Die Karolinen. Von Dr. Max Friedrichsen.

German New Guinea. **Hesse-Wartegg.**

Jahresb. Frankfurter V.G. u. Statistik **64** *and* **65** (1899–1901): 159–160.

Durch unbekannte Gebiete im Bismarck-Archipel. Von Hesse-Wartegg.

German New Guinea. *Globus* **79** (1901): 256. **Parkinson.**

Die Insel St. Matthias (Bismarck-Archipel). Von R. Parkinson. *With Map.*

Hawaii—Birds. **Bryan.**

Key to the Birds of the Hawaiian Group. By William Alanson Bryan. Honolulu: Bishop Museum Press, 1901. Size 12 × 10, pp. 76. *Plates.*

Marshall Islands. *Rep. Smithsonian I.* (1899): 487–508. **Winkler.**

On Sea Charts formerly used in the Marshall Islands, with notices on the Navigation of these islanders in general. By Captain Winkler. *With Illustrations.* Translated from the *Marine Rundschau*, Berlin, 1898.

New Hebrides. *Miss. Catholiques* **33** (1901): 309, 315, 332, 346, 355. **Deniau.**

Croyances Religieuses et Moeurs des Indigenes de l'Ile Malo (Nouvelles-Hébrides). Par le R. P. Alfred Deniau.

New South Wales. **Pittmann.**

Geological Survey of New South Wales. The Mineral Resources of New South Wales. By Edward F. Pittmann. Sydney, 1901. Size 8½ × 5½, pp. viii. and 488. *Map and Illustrations. Presented by the Agent-General for New South Wales.*

New Zealand. **Loughnan.**

New Zealand: notes on its Geography, Statistics, Land System, Scenery, Sport, and the Maori Race. By R. A. Loughnan. Wellington, N.Z., 1901. Size 6 × 10, pp. 110. *With Maps and Illustrations. Presented by the Minister for Lands, Department of Lands and Survey, Wellington, N.Z.*

Niuė Island. *J. Anthrop. I.* **31** (1901): 137–145. **Thomson.**

Note upon the Natives of Savage island, or Niué. By Basil Thomson.

Queensland. **Dunstan.**

Queensland Gov. Mining J. **2** (1901): 118–122, 162–170, 212–216.

Geology of the Dawson and Mackenzie Rivers. With Special Reference to the occurrence of Anthracitic Coal. Report by Mr. B. Dunstan. *With Diagrams.*

Western Australia. ———

Glasgow International Exhibition, 1901. Illustrated Handbook of Western Australia. Perth, W.A., 1901. Size 8½ × 5½, pp. viii. and 178. *Map, Plan, and Illustrations.*

POLAR REGIONS.

Antarctic. **Shipley.**

The Abyssmal Fauna of the Antarctic Region. By Arthur E. Shipley. (Reprinted from the 'Antarctic Manual,' 1901, chapter xviii. pp. 241–275.) Size 9 × 6, pp. 35. London, 1901.

Antarctic—Belgian Expedition. *Tour du Monde* **7** (1901): 313–408. **Gerlache.**

Quinze Mois dans l'Antarctique (Le premier Hivernage dans la Banquise australe). Par M. Adrien de Gerlache. *With Maps and Illustrations.*

Antarctic—Climate. *Globus* **80** (1901): 72–75. **Neger.**
Welche Eigentümlichkeiten in der heutigen Verteilung der Pflanzen lassen auf eine ehemalige Bewohnbarkeit der Antarktis schliessen? Von Dr. F. W. Neger.

Antarctic—German Expedition. *Scottish G. Mag.* **17** (1901): 461–467. **Bruce.**
The German South Polar Expedition. By William S. Bruce. *With Portrait.*

Arctic. *Ann. Hydrographie* **29** (1901): 414–425. **Bauendahl.**
Aus den wissenschaftlichen Ergebnissen der Polarfahrt des "Matador" unter Führung des Kapt.-Leut. a. D. Oskar Bauendahl, Herbst und Winter 1900–1901. *With Sketch-maps.*

This will be specially noticed.

Arctic. **Nathorst.**
Två Somrar i Norra Ishafvet, Kung Karls Land, Spetsbergens Kringsegling, Spanande efter Andrée i Nordöstra Grönland. Af A. G. Nathorst. 2 vols. Stockholm: Beijers Bokförlagsaktiebolag, 1900. Size 9½ × 6½, pp. (vol. i.) xxxvi. and 352, (vol. ii.) xiv. and 414. *Maps and Illustrations. Presented by the Author.*

This will be reviewed in the next number of the *Journal.*

Arctic—Baffinland. **Bell.**
A Survey in Baffinland, with a short description of the Country. By Robert Bell, M.D., etc. (From the *Geographical Journal* for July, 1901.) Size 10 × 6½, pp. 22. *Map and Illustrations.*

Arctic—Peary's Expedition. *National G. Mag.* **12** (1901): 357–361. ——
Peary's Work in 1900 and 1901. *With Portraits.*

Franz Josef Land—Meteorology. **Baldwin.**
U.S. Department of Agriculture. Weather Bureau. Report of the Chief of the Weather Bureau, 1899–1900. Part vii. Meteorological Observations of the Second Wellman Expedition. By Evelyn B. Baldwin. Washington, 1901. Size 11½ × 9½, pp. 351–436.

MATHEMATICAL GEOGRAPHY.

Astronomy. ——
Independent Day-Numbers for the year 1903, as used at the Royal Observatory, Cape of Good Hope. London: Eyre & Spottiswoode, 1900. Size 9¾ × 6, pp. 14.

Geodesy. *Atti R.A. Lincei, Rendiconti* **10** (1901): 35–39. **Pizzetti.**
Un principio fondamentale nello studio delle superficie di livello terrestri. Nota di Paolo Pizzetti.

Instrument—Sextant. *Nautical Mag.* **70** (1901): 561–565. **Law.**
A Short and Easy Method of Finding the Centring Error of a Sextant when at Sea. By Commander E. D. Law.

Maps. **Morrison.**
Maps: Their Uses and Construction. A Short Popular Treatise on the advantages and defects of Maps on various projections, followed by an outline of the principles involved in their construction. By G. James Morrison. London: Edward Stanford, 1901. Size 8 × 5½, pp. viii. and 110. *Diagrams. Presented by the Publisher.*

This is the subject of a special notice (*ante*, p. 528).

Motion of the Pole. *K.A.W. Amsterdam, P. Sec. Sci.* **3** (1901): 157–163. **Bakhuyzen.**
The motion of the Pole of the Earth according to the observations of the last years. By Dr. E. F. van de Sande Bakhuyzen.

Navigation. *Nautical Mag.* **70** (1901): 421–424. **Goodwin.**
The Mercator's Chart as an Ex-Meridian Table. By H. B. Goodwin, M.A.

Navigation. **Moore.**
The Law relating to Charts and Sailing Directions. By H. Stuart Moore. London: J. D. Potter, 1901. Size 9½ × 6½, pp. 8. *Presented by the Publisher.*

Illustrates the state of the law respecting the proper supply of charts to vessels by a statement of various cases which have come before the courts. A comparative table shows that the number of Admiralty charts printed rose from 272,115 in 1885 to 580,207 in 1900.

Time-determination. *Ann. Hydrographie* **29** (1901): 372–375. **Wirtz.**
Zeitbestimmung und Chronometerkontrole durch eine Höhendifferenz. Von Dr. Carl W. Wirtz.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Agricultural zones. *G.Z.* **7** (1901): 271–281, 333–342. **Hettner.**
Die Landbauzonen der aussertropischen Länder. Nach den Untersuchungen Th. H. Engelbrecht's. Von Prof. Dr. Alfred Hettner.

Dr. Engelbrecht's original work was fully reviewed in vol. xv. of the *Journal* (p. 52).

Climate. *Q.J.R. Meteorolog. S.* **27** (1901): 169–184. **Mill.**
Climate and the Effects of Climate. By Dr. H. R. Mill. *With Illustrations.*

Cosmogony. *American J. Sci.* **12** (1901): 140–142. **Fisher.**
Mathematical Notes to Rival Theories of Cosmogony. By O. Fisher.

Earthquakes. *Geolog. Mag.* **8** (1901): 449–452. **Oldham.**
The Periodicity of Earthquakes. By R. D. Oldham.

Geological History. **Cohen and Raken.**
K.A.W. Amsterdam P. Sec. Sci. **3** (1901): 63–66.
The Solubility of calcium carbonate in sea-water. By Dr. Ernst Cohen and H. Raken.

Gives the results of an investigation undertaken in connection with Prof. Dubois's researches as to the age of the Earth (see next entry).

Geological History. *K.A.W. Amsterdam, P. Sec. Sci.* **3** (1901): 43–62, 116–130. **Dubois.**
The Amount of the Circulation of the Carbonate of Lime and the Age of the Earth. By Prof. Eug. Dubois.

Geology. *Geolog. Mag.* **8** (1901): 445–449. **Ackroyd.**
On the Circulation of Salt in its Relations to Geology. By William Ackroyd.

Geology. *B.S.G. Com. Havre* **18** (1901): 321–339. **Beaugrand.**
Les phénomènes géologiques actuels, au point de vue de la géographie. Par Ch. Beaugrand.

Meteorology. *Climate* (1901): 144–155. **Majevski.**
For and against the Influence of the Moon on the Life of the Earth and its Atmosphere. By Zdislaw Majewski.

A summary of the views of the chief writers on the subject. The author gives his verdict in favour of the supposed influence of the moon on the weather.

Meteorology. *Monthly Weather Rev.* **29** (1901): 152–159, 306–307. **Pockels.**
The theory of the formation of precipitation on mountain slopes. By Prof. F. Pockels.

A quantitive analysis of the laws which govern the movements and adiabatic cooling of air impinging on a mountain slope, leads the writer to the conclusion that there exists a zone of maximum precipitation on the windward slope, and that the inclination of the surface is of more importance in determining the quantity of precipitation than the absolute elevation. The article originally appeared in the *Ann. der Physik*, and is reproduced also in the *Meteorol. Zeitschrift* (1901, pp. 300–312).

Phyto-geography. *Die Natur* **50** (1901): 337–340. **Roth.**
Ueber die Vegetation der Gewässer. Von Dr. E. Roth.

Waves. *Nautical Mag.* **70** (1901): 429–442. **Allingham.**
Abnormal Seas. By William Allingham.

The bulk of the paper is taken up with instances of exceptionally high seas, which the writer attributes to the action of the wind rather than to submarine earthquakes.

Zoogeography. *Naturw. Wochenschrift* **16** (1901): 304–306. ———
Die Bipolarität in der Verbreitung der Meeresorganismen.
Based on an article in *Ymer* by Prof. H. Théel.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Commercial Geography. *Die Natur* **50** (1901): 231–234, 244–246, 256–258. **Messmer.**
Bitumen und Asphalt. Von Herm. Messmer.

Commercial Geography. ——
The World's Commerce and the United States' share of it. 1900. Philadelphia: Commercial Museum, 1901. Size $8\frac{1}{2} \times 4$, pp. 20.

Commercial Geography—Gold. *J.R. Statistical S.* **64** (1901): 415–433. **Hooper.**
The Recent Gold Production of the World. By Wynnard Hooper.

Economic Geography. *G.Z.* **7** (1901): 425–434. **Losch.**
Einige Bemerkungen über Wirtschaftsstatistik, Wirtschaftsgeographie und Kartographische Darstellung. Von Dr. Hermann Losch.

Languages. **Cust.**
List of Literary Languages spoken and written in the Dominions of Her Majesty Queen Victoria at the close of the Nineteenth Century. By Robert Needham Cust, LL.D. Size $8 \times 5\frac{1}{2}$, pp. 16. Hertford, 1901.

Population. *Mém. Couronnés A.R. Belgique* **59** (1900): pp. 16. **Denis.**
Le mouvement de la population et ses conditions économiques. Par Hector Denis. *With Diagrams.*

Prince Henry the Navigator. **Mees.**
Henri le Navigateur et l'Académie Portugaise de Sagres. Par le Dr. Jules Mees. Bruxelles, 1901. Size 9×6, pp. [34]. *Presented by the Author.*

The author holds that the idea of a Geographical Academy founded at Sagres by Prince Henry, is based only on the statement of Duarte Pacheco Pereira, repeated by Barros, that the prince obtained the services of one Jacome of Majorca as cartographer.

The Earth and Man. *Ann. G.* **10** (1901): 97-114, 193–215 **Woeikof.**
De l'influence de l'homme sur la terre. Par Prof. A. Woeikof.

A clear summary of the various ways in which the natural features of the Earth are modified through the action of man.

Village types. *Globus* **79** (1901): 293-298, 318–323. **Buchwald.**
Der Ursprung des Rundlings. Von Dr. Gustav v. Buchwald. *With Maps.*

BIOGRAPHY.

Banning. *Annuaire A.R. Belgique* (1900): 81–152. **Brialmont.**
Notice sur Émile Banning. Par Général Brialmont. *With Portrait.*

Emile Banning took an important part in the movement for the acquisition of colonies by Belgium.

Bergman. **Lindquist.**
Framställning af Torbern Bergmans Fysiska Geografi. 1. Af John Lindquist. Stockholm, 1900. Size 9×6, pp. 112.

An analysis of the work published by Torbern Bergman in 1766, with a brief sketch of the author's life.

Bonney. *Geolog. Mag.* **8** (1901): 385-400. ——
Eminent Living Geologists. The Rev. Professor T. G. Bonney, D.SC., etc. *With Portrait. Also separate copy, presented by Prof. Bonney.*

Chaix. *Le Globe, B.S.G. Genève* **40** (1901): 143-154. **Goegg, Gautier, Saussure.**
Le Professeur Paul Chaix, président honoraire de la Société de géographie de Genève. Discours de MM. E. Goegg, R. Gautier, H. de Saussure, lettre de la Société Neuchâteloise de Géographie.

Kubary. **Thiel.**
Betreffend "Kubary-Denkmal." Size 9×6, pp. 16. *Portrait.*

A circular in support of the proposed monument to J. S. Kubary on Ponape, where the well-known Polish traveller died in 1896. It contains a biography reprinted from the *Kolonialzeitung* for 1899.

Lapworth. *Geolog. Mag.* **8** (1901): 289–303. ——
Eminent Living Geologists. Professor C. Lapworth, LL.D., F.R.S., F.G.S. *With Portrait.*

Leue. *Deutsche Rundschau G.* **23** (1901): 521–522. ——
Hauptmann A. Leue. *With Portrait.*

Captain Leue has done good work as a pioneer in German East Africa.

GENERAL.

Bibliography. ——

International Catalogue of Scientific Literature, Instructions, Schedules, and Lists of Journals. Size $8\frac{1}{2} \times 5\frac{1}{2}$.

The instructions for the use of those engaged in the compilation of the International Catalogue of Scientific Literature, of which the first set of volumes will deal with 1901, are printed in English, French, German, and Italian. The schedules giving the subdivisions of the various sciences, and the lists of journals to be dealt with, are also being issued. Each branch of science has a special index letter (a capital), and the subdivisions are denoted by numerals and small letters. Under geography, physical and mathematical (J), the Earth as a whole and its main subdivisions are represented by the letters from *a* to *o*, letters being again used in combination for the smaller divisions. Thus *d* stands for Europe, *de* for the British Isles. For the subject headings (mountains, valleys, cartography, etc., etc.) numerals are used. The classification is generally satisfactory except in the case of Africa, where we find such overlapping divisions as "West Africa from Morocco to the Congo;" "Sahara and French Sudan."

British Empire. **Jose.**

The Growth of the Empire. A Handbook to the History of Greater Britain. By Arthur W. Jose. London: John Murray, 1901. Size $8 \times 5\frac{1}{2}$, pp. xvi. and 422. *Maps. Price 6s. Presented by the Publisher.*

While supplying a useful summary of the historical facts connected with the growth of the British Empire, this work has a higher value through the endeavour which has been made to trace the principles at work throughout the course of that growth, and the lessons to be learnt for the future. The author shows a keen sense of the importance of the *rôle* to be played by the empire, and the corresponding responsibility resting with the British nation.

Census Results. *J.R. Statistical S.* **64** (1901): 493-526. **Baines.**

Census Notes. By J. A. Baines, C.S.I.

On the broad features brought out by recent censuses.

Education—Methods. *Scottish G. Mag.* **17** (1901): 393-399. **Reclus.**

The Teaching of Geography, Globes, Discs, and Reliefs. By M. Elisée Reclus.

Educational. **Heiderich.**

Oesterreichische Schulgeographie. Erster Theil: Für die I., II., und III. Classe der Mittelschulen. Von Franz Heiderich. Wien: Ed. Holzel, 1901. Size 9×6, pp. vi. and 304. *Plates. Presented by the Publisher.*

This is a well-arranged text-book for the use of middle-grade schools. It is divided into two sections, the first dealing with the broad principles of mathematical and physical geography, with a brief sketch of the main characteristics of the several continents. The second, intended for higher classes, describes the principal laws of climatology, but is in the main devoted to a study in detail of regional geography. There is a good series of illustrations, showing the main types of surface, etc.

French Colonies. **Zimmermann.**

Die Europäischen Kolonien, Vierter Band. Die Kolonialpolitik Frankreichs. Von den Anfängen bis zur Gegenwart. Von Dr. Alfred Zimmermann. Berlin: E. S. Mittler und Sohn, 1901. Size $9\frac{1}{2} \times 6$, pp. xiv. and 438.

A valuable historical sketch of French colonization from its first beginnings in the fourteenth century. Incidentally it deals likewise with early French exploration, especially in North America.

Geographical Congress. *Rev. G. Italiana* **8** (1901): 217-244, 304-336, 409-419. ——

Il Quarto Congresso Geografico Italiano.

Geographical Congress. *National G. Mag.* **12** (1901): 351-357. ——

Next International Geographical Congress to be held in Washington. *With Portraits.*

Contains a sketch of the past history of the Congress, and some suggestions respecting the programme of the Washington meeting.

Geographical Errors. *B. American G.S.* **33** (1901): 259-264. **Gannett.**

Certain Persistent Errors in Geography. By Henry Gannett.

Mr. Gannett classes as errors a certain number of ideas about which expert opinion is, to say the least, divided, *e.g.* the effect of forests, not only on rainfall, but on the flow

of water in rivers. Again, while denying the effects on climate usually attributed to ocean currents, he assigns to these a preponderating *rôle* in the equalization of the temperature of the ocean. The comparative warmth of the latter in high latitudes, and the resulting effect on climate, is therefore, on his own showing, ultimately due to the movement of the warmer water towards the poles.

Geographical Progress. *B.S.G. Italiana* **2** (1901): 615–636. **Vedova.**

I progressi della Geografia nel Secolo XIX., discorso del Prof. G. Dalla Vedova.

German Colonies. *Rev. G.* **49** (1901): 13-26, 124–135. **Brisse.**

Le développement colonial allemand. Par André Brisse. *With Map.*

Library Catalogue. **Boosé.**

First Supplementary Catalogue of the Library of the Royal Colonial Institute. Compiled by James R. Boosé, Librarian. London: Published by the Institute, 1901. Size 11 × 7½, pp. cclxxviii. and 794. *Presented by the Institute.*

The great growth of the library of the Royal Colonial Institute during the last seven years, owing to the endeavour which has been made to obtain all the earlier published works bearing on the discovery, acquisition and settlement of the British colonies, has necessitated the issue of a supplement nearly double the size of the original catalogue. The work will prove most valuable from a bibliographical point of view, as well as a guide to the contents of the Colonial Institute library. It is to be regretted that, as the entries are classified almost entirely under the headings of the various British possessions, many works referring to other colonies are incorrectly placed in the catalogue.

Library Catalogue. ——

Colonial Museum and Geological Survey of New Zealand. Catalogue of the Colonial Museum Library. Second Edition. Wellington, 1900. Size 9½ × 6, pp. 156. *Presented by the Colonial Museum.*

Nomenclature. *Rev. G. Italiana* **8** (1901): 369–374. **Ricchieri.**

Toponomastica e Nomenclatura Topografica Dialettale. Prof. Giuseppe Ricchieri.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

Ordnance Survey of England and Wales: Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from October 1 to 31, 1901.

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With hills in brown or black: 87, 146, 163, 196 (engraved), 1*s.* *each*. Printed in colours: 170, 176, 180, 1*s.* *each*.

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7, 8, 9, 10, 11, 12, 13, 14, 15, 16; XV. 10, 11, 12, 13, 14, 15, 16; XVI. 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; XVII. 1, 5, 9; XXIV. 2, 3, 4, 6, 8, 10, 11, 12, 14, 15, 16; XXV. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; XXVI. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; XXXIII. 7; XXXIV. 1, 2; XXXV. 1, 2, 3, 4, 5, 6, 7. **Huntingdonshire,** II. 10, 13, 14, 15; V. 3; VI. 1, 5, 6, 10, 11, 15, 16; X. 2, 3, 4, 8, 9, 11, 12, 15, 16; XIV. 4, 6, 7, 8, 12, 14, 15, 16; XVIII. 2, 4, 8, 9, 11, 12, 13, 14, 15, 16; XX. 15, 16; XXI. 4; XXII. 1, 2, 4, 10, 11, 12, 13, 14, 15; XXIV. 4, 8, 12; XXV. 6, 11, 15; XXVI. 1, 2, 5, 6, 9, 10; XXVII. 3, 7, 8; XXVIII. 5. **Monmouthshire,** VIII. 16; IX. 9, 10, 14; XII. 1; XIV. 4, 12, 14, 16; XX. 4, 7, 11, 16; XXII. 8; XXV. 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; XXVIII. 12, 15; XXIX. 9; XXX. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13; XXXIII. 8; XXXIV. 5 (15 and 16). **Montgomeryshire,** X. 4; XI. 1, 10; XIII. 16; XIV. 13, 14, 15; XIX. 16; XX. 14, 16; XXI. 4, 13, 14, 15; XXII. 1, 2, 3; XXVI. 4, 7; XXVII. 3, 4, 8; XXVIII. 2, 5, 6, 10. **Shropshire,** VI. 8, 11, 12, 14, 15, 16; VII. 13; IX. 10; XIII. 2, 3, 4, 6, 7, 8, 10, 11, 12, 14, 15, 16; XIV. 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12; XV. 1, 5; XIX. 10, 11, 12, 14, 15, 16; XX. 2, 9, 10, 11, 12, 14, 16; XXV. 4; XXVI. 1, 2, 7, 8, 10, 12; XXVII. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12; XXVIII. 1, 2, 5, 6, 10. **Staffordshire,** XXXVII. 15; XLVII. 1, 2, 14; LIII. 2, 3, 12; LIV. 5, 10. 3*s. each.*

4 miles to 1 inch:—
Salisbury Plain, with roads printed in colour, 9*d.*, folded in cover.

(*E. Stanford, London Agent.*)

France. Sullivan-Alexander.

Map showing Consumption of French and Foreign Coal in 1899. Designed and executed by Henry Sullivan-Alexander. Issued by the American Coal and Shipping Agency, Paris. *Presented by Henry Sullivan-Alexander, Esq.*

Four maps on one sheet, showing by a system of colour-tinting and figures, the relative quantities of French, British, Belgian, and German coal consumed in the various departments of France during the year 1899. Additional information is also given in tabular form, concerning the annual consumption of coal in the United Kingdom, Belgium, Germany, the United States, and Algeria.

Germany. Konigl. Preuss. Landes-Aufnahme.

Karte des Deutschen Reiches. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheets: 144, Osten; 208, Rotenburg; 235, Verden; 236, Walsrode; 261, Neustadt. Herausgegeben von der Kartogr. Abtheilung der Konigl. Preuss. Landes-Aufnahme, 1901. *Price* 1.50 *mark each sheet.*

Germany. Langhans.

Die Wassererwerbs-Bevölkerung in Deutschen Reich. Anteil der Binnenschiffahrts-Bevölkerung des Deutschen Reichs an der Gesamtbevölkerung der kleinen Verwaltungsbezirke. Nach der Berufszählung von 1895.—Anteil der Schiffsbau-Bevölkerung an der Gesamtbevölkerung an der mittleren Elbe und Oder.—Schiffsbau-Bevölkerung.—Reederei-Bevölkerung. Scale 1 : 3,750,000 or 59·2 stat. miles to an inch.—Die Wassererwerbs-Bevölkerung im Verhältnis zur Gesamtbevölkerung des Deutschen Reichs. Scale 1 : 7,000,000 or 115 stat. miles to an inch. *Petermanns Geographische Mitteilungen,* Jahrgang 1901, Tafel 17. Gotha: J. Perthes. *Presented by the Publisher.*

Lapland. Petermanns Geographische Mitteilungen.

Uebersichtskarte der Niederlassungen an der Murman-Küste. Scale 1 : 2,000,000 or 31·6 stat. miles to an inch.—Uebersicht des Katharinen-Hafens. Scale 1 : 30,000 or 0·5 stat. mile to an inch.—Die Niederlassungen am Katherinen Hafen. Scale 1 : 20,000 or 0·3 stat. mile to an inch.—Skizze der projektierten Nordbahn. Scale 1 : 20,000,000 or 316 stat miles to an inch. *Petermanns Geographische Mitteilungen,* Jahrgang 1899, Tafel 9. Gotha: J. Perthes. *Presented by the Publisher.*

Russia. Shevelevuim.

Map of European Russia and Siberia. Scale 1 : 3,000,000 or 47·4 stat. miles to an inch. A. Shevelevuim. St. Petersburg, 1901. 4 sheets.

In addition to the general map of European Russia, which shows railways constructed and projected, there is an inset of Asiatic Russia, showing the Trans-Caspian and the Trans-Siberian railways. There are also several insets of plans of cities and towns, and their immediate surroundings.

ASIA.

China. **Bureau Topographique des Troupes de l'Indo-Chine.**

Carte de l'Indo-Chine. Scale 1 : 200,000 or 3·1 stat. miles to an inch. Sheets: "Muong Sing," "Dien-Bien-Phu," "Khanh-Hoa," "Xieng-Khouang," "Muong Lan," "Vien Poukha," "Vinh-Long," "My-Tho," "Vinh," "Thanh Hoa," "Hue," "Quang Tri," "Ha Ting," "Bongson," "Tourane," "Muong-Hou-Neua," "Mong-Tze," "Lai-Chau," "Lao-Kay," "Cao-Bang," "Long-Tcheou," "Kai-Hoa," "Yen-Minh," "Yen-Bay," "Thai-Nguyen," "Lang Son," "Pak-Hoi," "Muong Son," "Muong Het," "Hanoi," "Luang-Prabang," "Saigon." Bureau Topographique des Troupes de l'Indo-Chine.

The thirty-two sheets mentioned above form part of a large map of Indo-China, which is now in course of publication, and are compiled principally from the route surveys of French officers. When complete the map will include the whole of Tongking, Annam, Cambodia, and Cochin China, as well as the neighbouring portions of Siam and China; but at the present time the sheets that have been issued comprise only Tongking, the coast of Annam, and a part of Cochin China. Many blank spaces occur, and much of the detail that is given is evidently of a doubtful character, owing to the want of reliable information. The graduation of the sheets is on the metric system. The map is a somewhat rough production, printed in colours, and it is apparent that it is only to be considered as provisional.

China. **Konigl. Preuss. Landes-Aufnahme.**

Karte von Ost-China. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. Kartographische Abtheilung der Konigl. Preuss. Landes-Aufnahme, 1901. Sheets: "Nanking" and "Hankau," "Peking," "Tsi-nan-fu," "Tsing-tau," "Mukden."

Each of these sheets includes four degrees of latitude and six degrees of longitude. There is not at the present time sufficient information available to make anything like a complete map of China on so large a scale as 1 : 1,000,000; and in districts away from beaten tracks, no great confidence can be placed upon the details given on these sheets. It would perhaps have been better if parts that are merely sketched in from doubtful sources had been clearly distinguished from others that may be considered fairly accurate. Sheets "Nanking" and "Hankau" are chiefly from unpublished material furnished by Baron Ferd. v. Richthofen. A comparison of this map with that of the French government map now being published, and on the same scale, shows discrepancies and differences, some of which are considerable.

China. **Madrolle.**

Atlas de l'Empire Chinois. Par Cl. Madrolle. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. Sheet: "Tchao-Tong." Millet, Paris.

This sheet includes portions of the frontier region of Sechuan and Yunnan between lat. 26° 6' and 28° 38' N., and long. 100° 53' and 104° 31' E. of Greenwich. No hill-work is shown. Rivers, their names, the names of travellers, altitudes in metres, and the location of minerals, are given in blue, while names of places and travellers' routes are shown in black. In a region so mountainous as this, to publish a map with no indication of the mountains seems somewhat remarkable, though of course it is a considerable saving in expense.

AFRICA.

Congo Free State. **Droogmans.**

Carte du Bas Congo. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Par H. Droogmans. Bruxelles: A. de Schaepmeester, 1900. *With Text.* 15 *Sheets.*

This map includes the course of the lower Congo, and the portion of the Congo Free State lying between Stanley Pool and the coast. It is based upon seventy positions which have been astronomically determined, and which are indicated upon the map by a special symbol. The right bank of the river from Banana to Ponta da Lehna, with the creeks, is drawn according to a chart by M. Sterpin; the course of the river between Malela and Boma is from the recent surveys of Commander Purey-Cust, R.N., while in the neighbourhood of Boma the triangulation of M. Mahieu has been utilized. The details given in the charts and sketches furnished by Stanley, Baumann, and Dupont have served for the drawing of the river in the neighbourhood of the cataracts. Stanley Pool is according to Stanley's delineation, with certain alterations and corrections by Delporte and others. The railway between Matadi and Stanley Pool is reduced from a large plan of the Campagnie du Chemin de Fer du Congo. These are only some of the sources from which this map has been compiled; a complete

list of all the authorities consulted is given in the volume of letterpress which accompanies the map, and which also gives a description of the area included in each sheet.

Although somewhat rough in appearance, the map is clearly drawn, and tinted in black and white. Altitudes are shown in metres, and in addition to the ordinary graduation, giving latitude and longitude (the latter from Greenwich), scales are given round the border of each sheet showing distances in kilometres south of the equator and east of the meridian of 20° E. long. from Greenwich. The object of this latter arrangement is to facilitate the computation of the distance between any two places on the map, which can of course be found, when the difference in kilometres in the two directions east and west and north and south is known, by the formula $AB = \sqrt{AC^2 + BC^2}$, where AC is base, and BC the perpendicular of a right-angled triangle, of which the required distance is the hypotenuse AB. This would doubtless give the distance between two places near enough, as the area covered by the map includes only a few degrees of latitude and longitude; but unless the places are a considerable distance apart, and are on different sheets, it is questionable if many persons would put themselves to the trouble of going through this computation when they can measure the distance directly from a scale in the ordinary way.

Portuguese East Africa. **d'Andrade.**

Carta da Região Mineira de Manica. Scale 1 : 50,000 or 0·8 stat. mile to an inch. Levantada sob a Direcção do Capitão d'Engenharia Affredo Augusto Freire d'Andrade. Reduzida e Coordenada por José Gonzalez del Valle, e E. Raimundo Gonzalez del Valle. Publicado com auctorisação da Companhia de Moçambique, 1900. Erhard Frères, Paris. *Price* £1.

Since the final demarcation of the boundary-line between the British and Portuguese territories in South-East Africa in 1898, the Portuguese have completed a survey of Manica, the results of which are published on this map. It shows the country around Massi Kessi and the railway from that place to the British frontier. Contour-lines are given in brown at intervals of 20 metres, in addition to which the relief is indicated by shading. Mining claims are coloured in red, and a number is affixed to each. These numbers are again given in a table in a corner of the map, with the corresponding names of the property.

South Africa. **Johnston.**

Map of South Africa. Scale 1 : 1,357,280 or 23 stat. miles to an inch. W. & A. K. Johnston: London & Edinburgh, 1901. 2 sheets. *Presented by the Publishers.*

A wall map of South Africa evidently intended for educational purposes. The colouring of the political divisions and boundaries to a great extent obscures the physical features of the country, as is often the case with maps of this kind. This is to be regretted, as it would have proved far more instructive if the general relief and leading physical characteristics had been more clearly brought out. Names of places of importance in connection with the war, and some sites of battles, are indicated.

Uganda. **Petermanns Geographische Mitteilungen.**

Karte des Uganda-Protektorats. Nach den neuesten amtlichen Quellen. Scale 1 : 4,000,000 or 63 stat. miles to an inch. *Petermanns Geographische Mitteilungen.* Jahrgang 1901, Tafel 18. Gotha: J. Perthes. *Presented by the Publisher.*

AMERICA.

Alaska. **Carlsen.**

Map of Cape Nome and adjacent mining districts. Scale 1 : 145,728 or 2·3 stat. miles to an inch. By E. Carlsen. Seattle, Washington: The O.P. Anderson Map & Blue Print Co. *Price* 50 *cents. Presented by H. T. Burls, Esq.*

This is a blue print showing the mining districts of the neighbourhood of Cape Nome.

Alaska. **Kemp and Kingsbury.**

Map of Cape Nome and Golovin Bay, and Cape York Mining districts. Scale 1 : 760,320 or 12 stat. miles to an inch. By Charles Kemp and A. G. Kingsbury. Seattle, Washington: Lowman and Hanford Stationary & Printing Co., 1900. *Presented by H. T. Burls, Esq.*

Gives also, as insets, geological sections, and plans of the El Dorado mining district, Nome city and vicinity.

Haïti. **Tippenhauer.**

Topographische und geologische Karte eines Teils der Republik Haïti zwischen Gonaïves, Grande Rivière und Maïssade. Scale 1 : 100,000 or 1·6 stat. mile to an

inch.—Tafel der verschiedenen Stellen des Zutagetutens eines Lignitlagers in der Gegend zwischen den Flüssen Piedre und Canot und der Kommune Maïssade. —Topographische und geologische Karte des Morne de la Selle, der Cul-de-Sac-Ebene und des Salzseengebietes, Insel Haïti. Scale 1 : 100,000 or 1·6 stat. mile to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1901, Tafels 12 und 13. Gotha : J. Perthes, 1901. *Presented by the Publisher.*

A continuation of the important series of maps showing the geology of the island of Haïti, which have recently appeared in *Petermanns Geographische Mitteilungen*, with valuable papers by the same author.

North America. **Stanford.**

Map of the United States, showing the principal United States and Canadian Railways quoted in the Daily Stock Exchange lists. Scale 1 : 5,274,720 or 83·25 stat. miles to an inch. E. Stanford : London, 1901.

AUSTRALASIA.

British New Guinea. **Survey Department, Brisbane.**

Map of British New Guinea. Scale 1 : 2,027,520 or 32 stat. miles to an inch. Survey Department, Brisbane, Queensland, 1900.

The surveys of Sir William Macgregor and others have been made use of in the compilation of this map. Insets of Port Moresby and Samarai (Dinner island) are given on enlarged scales, and steamer routes to neighbouring islands and ports in Queensland, with the distances, are laid down. The map is on a small scale, and the photo-lithography process by which it has been produced has not proved very successful, many of the names being very indistinct.

GENERAL.

Telegraph Lines. **Bureau International des Administrations Télégraphiques.**

Carte Générale des Grandes Communications Télégraphiques du Monde. Dressée d'après des documents officiels par le Bureau International des Administrations Télégraphiques. Berne, 1901.

CHARTS.

North Atlantic Ocean and Mediterranean Sea. **Meteorological Office, London.**

Monthly Pilot Chart of the North Atlantic Ocean and Mediterranean Sea for September and November, 1901. London Meteorological Office. *Price 6d. Presented by the Meteorological Office.*

U.S. Charts. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for October and November, and North Pacific Ocean for November 1901. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Abyssinia. **Gwynn.**

Eighteen Photographs of Abyssinia, by Major C. W. Gwynn, D.S.O., R.E. *Presented by Major C. W. Gwynn, D.S.O., R.E.*

These photographs form part of the series presented by Major Gwynn some time ago, and which were noticed in the *Geographical Journal* for August last. The following is a list of their titles :—

(1) Eisa Somali camels ; (2–4) Somali war-dance (Eisas) ; (5) St. Raguel's church, Entotto ; (6) Clock-tower and palace, Addis Abbaba ; (7) Gibe (palace), Addis Abbaba ; (8) Audience chamber, palace, Addis Abbaba ; (9) British Residency, Addis Abbaba ; (10) Fuel stores, palace, Addis Abbaba ; (11) Dining-hall, palace, Addis Abbaba ; (12–14) Donakils at Ewer Gota, Hawash valley ; (15) Gunz village, J. Matongwe ; (16) River Dinder between Dunkar and Abu Ramla ; (17) J. Matongwe, near Abu Ramla, showing Gunz village on top ; (18) Abyssinian officer.

Venezuela, Trinidad, Port Darwin. ———

Twenty Photographs of the Caratal District, Venezuela, by T. F. Gomez Burke, 1884–85.—Three Photographs taken in Trinidad, West Indies, 1885.—Five Photographs of Port Darwin, by J. M. Neilson. *Presented by H. G. Slade, Esq.*

Some of these photographs have an interest from a historical point of view, especially those representing the mining operations in the long-disputed territory of Guiana,

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Scotland. Size 24 × 18 inches	1	9

Nos. 23 and 24 are identical with Nos. 2 and 6, but with sheet lines added, printed on thin paper, and coloured to show civil parishes.

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* Publication in progress.

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